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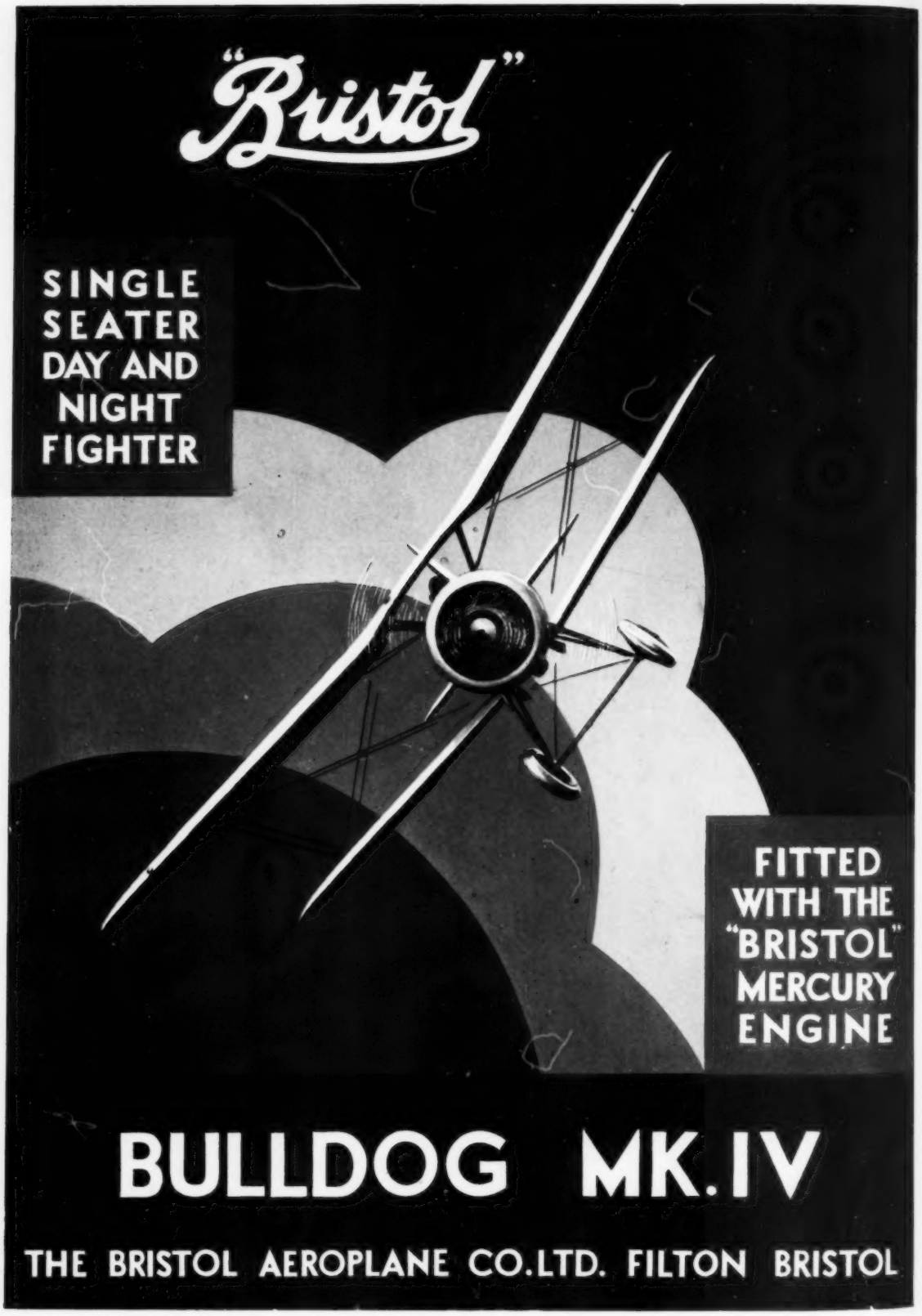
No. 1414
Vol. XXIX

AIRPORTS AND THEIR EQUIPMENT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The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Airports Conference

THIS issue of *Flight* makes a special feature of the organisation and equipment of airports for the benefit of, among others, those who will attend the annual conference of the Aerodrome Owners' Association. We feel sure that the delegates will all find it a useful number.

It seems a great pity that the report of the Maybury Committee, which is believed to be imminent, could not have been published before the holding of the conference. The report may not make any great difference to those who are already owners of aerodromes, but it may make a considerable difference to those parties, especially local authorities, who are now debating in their minds whether to invest in an aerodrome or not. If the report of the Maybury Committee does fulfil expectations by laying out a scheme of probable internal air routes and indicating the cities on those routes which would be well advised to set up, as soon as may be, either a fully equipped airport or a humble but useful landing ground with a petrol pump and a telephone, it may be taken for granted that representatives of those cities would come to the conference and would visit the exhibition which goes with it in a very purposeful frame of mind.

Need of Advice

There are some flying people who are not in the least interested in keeping down the rates of this or that municipality, but who want to have as many aerodromes in the country as possible, so that they may get the utmost use out of their aeroplanes. Their desire is natural. Some spokesmen of that party have done their utmost to stampede municipalities into hurried purchase of aerodromes by the warning that those who did not own them would soon be in the position of towns without railway stations, and that if local authorities did not act quickly the price of the land would be raised against them. Municipalities in general have not shown much tendency to be stampeded by this awful warning, but many of them are in real need of sound, disinterested advice on the subject.

Still, even though the Maybury report has not yet been issued, this conference should be able to do very useful work. There are already a number of airports in the country, and there will certainly have to be many more. It is most desirable that there should be a common policy as regards organisation, and also a common standard of equipment. Such standardisation can best be achieved by comparing ideas at a conference like this, and inspecting various types of equipment at a comprehensive exhibition. Breaks of gauge are not desirable on an airway.

A Willing Horse

AT a moment when the works of the aircraft industry are full to overflowing with construction of machines to complete the expansion programme of the Royal Air Force, and when naval correspondents assure us that the Government is taking decisions to make good the deficiencies of the Navy, the *Morning Post* has published a series of articles on the weakness of Britain's defences. These articles seem rather like flogging a willing horse. Perhaps, however, they were not intended to perform that useless function. They may be taken as a warning against the folly of seeking for peace by disarming oneself. Britain has tried that policy once, and a Socialist Government may try it again. It certainly seems clear that some other nations have come to the conclusion that they may now take liberties with Britain, as the latter is not strong enough to make them pay for it; and that this situation has brought us nearer to war than is at all comfortable.

No one doubts the truth of Sir Samuel Hoare's words that if Italy were to attack us we should strike back and should probably do so with complete success. A nation which has a very large army engaged in a country separated from the homeland by the Suez Canal is very badly situated for making attacks on a great naval Power; and despite all deficiencies Britain is still a great

naval Power. The thought of what would happen to the Italian army in Abyssinia if the British Navy were to blockade the coasts of Eritrea and Italian Somaliland should be enough to deprive Signor Mussolini of his sleep. The *Morning Post* points out, however, that even if we suffered small casualties in a successful war, we should be so weakened that we should lie at the mercy of other nations. A margin to allow for casualties is a necessity for all great Powers. War, fortunately, is not likely if only for the reason given above—the precarious nature of the Italian line of communications—and before the next European crisis arises we may hope to be strong enough to hold our own against all comers.

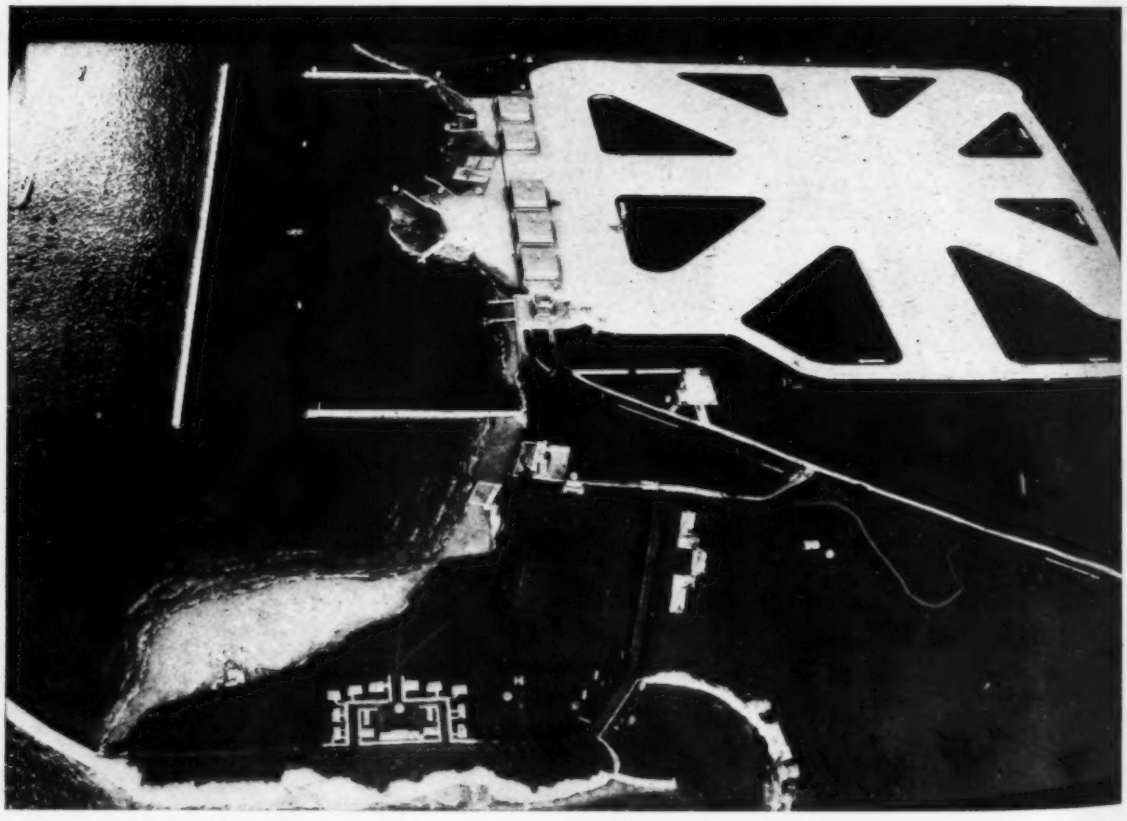
Despite the great efforts now being made and contemplated, there are still reasons for disquietude. As Air Comdre. Chamier pointed out in his lecture to the British Empire League on election day, the presence of the sea round our country complicates the preparations for air defence. It is easier for the defence to get early warning of approaching raiders when they come over land than when they come over the water. Recent improvements in the design of aircraft have brought London within the range of bombers from countries which not long ago did not seem worth attention as possible assailants. There is no need to exaggerate; and to draw conclusions from the maximum range of a particular design of machine when loaded only with fuel and unable to carry any bombs at all only creates needless apprehension. Even so, bases one thousand miles away might still be able to attack London and expect to see some of their bombers return home.

So far as the raising of new squadrons and the construction of new aircraft go, the Air Ministry is doing as much as can be done. The War Office has also done something by organising an Anti-Aircraft Division of the Territorial Army for the special defence of London. It is very necessary that this division should be up to full strength and highly trained, as well as being equipped with the very latest types of gun, searchlight, and sound-locator. It would be comforting to have an official assurance that all is well in this direction.

And the Provinces

Other parts of the country besides London need air defence, and we should like to know that this matter is in hand. For all parts there is need of organised posts of the Observer Corps, and hitherto the expansion of that invaluable body of men has not been exactly hurried. Great energy in recruiting for Air Defence Territorials and Observers is one of the greatest needs of the day.

And yet, despite great admiration for the enthusiasm and the efficiency of the men of the Territorial Army, it still is a burning question whether at least a nucleus of the anti-aircraft personnel ought not to be regulars. The work requires continuous practice such as half-time men can hardly give to it. These gunners may fire the first shots in a war.



THE IDEAL LAND-AND-SEA AIRPORT, as visualised by Imperial Airways. Note the runway system on the aerodrome, and the careful layout of the terminal buildings in relation to the aerodrome and the flying-boat harbour. It is obvious that when Imperial Airways start their new flying-boat services, they will wish to link them up with landplane routes, so perhaps this model—which is one of those at "The Empire's Airway" exhibition now concluding at South Kensington—may be taken as foreshadowing actual developments. (*Flight* photograph.)

The Outlook

A Running Commentary on Air Topics

The Airports Exhibition

WHEN Sir Philip Sassoon, Under-Secretary of State for Air, declares the Airports Exhibition open this morning at 11.30 he will have the distinction of being the first to open an exhibition of this kind in this country. Hitherto there has been no opportunity to show such an extensive range of aerodrome equipment as that which will be on view at British Industries House during the last three days of this week. Aero shows at Olympia have been few and far between, and when the last was held, in 1929, regular air line operation had not attained any great magnitude or importance. Moreover, the technical progress made during the last six or seven years with floodlighting and radio, to mention but two appurtenances to modern airways operation, has been such that the whole position is changed.

More than seventy firms are exhibiting equipment used at or suitable for the modern airport, and a good many more are in the field, as the review of the firms on pp. 123-129 of this issue of *Flight* will indicate. Naturally it will not be possible to exhibit aerodrome buildings or some of the larger pieces of equipment used at airports, but in such cases models and pictures will give a very good idea of what is being done.

The question of what is the most suitable layout and organisation of an airport is not one which can be readily answered; so much depends on local conditions. In general, however, it may be said that a possibility exists of making a relatively small beginning. A fairly large field, with a petrol supply, a wind stocking and a telephone will suffice in many cases, provided the adjacent fields are kept available for subsequent inclusion in the aerodrome, should increase in air traffic make such extension desirable.

From that modest beginning, through a range of intermediate stages, is reached the large terminal airport which serves as a junction for long-distance air routes and the internal air lines. What the terminal aerodrome of the future will be like is difficult to forecast, but the model in the exhibition at South Kensington may, perhaps, be taken as an indication of the broad lines which development will demand. The terminal of a long-distance flying boat service must obviously be linked up with overland air routes, and we may see an aerodrome next door to a seaplane base, as suggested in the picture on the opposite page.

The Conference

MEMBERS of the Aerodrome Owners' Association will find much to talk about during the annual conference which is being held to-morrow concurrently with the airports exhibition, when three papers are to be presented and discussed. Major Mealing, of the Directorate of Civil Aviation, will explain the details of building an aerodrome, while Major Hamer, City Engineer of Hull, will elaborate the interesting problems encountered in acquiring and planning a municipal airport. Radio is playing an ever-increasing part in all-weather airline operation, and Mr. Denman, of Airwork, Heston, will explain the various systems of radio communication in use.

The fact that more than sixty townships and organisations interested in aerodrome ownership and operation are sending delegates to the conference shows the wisdom of the S.B.A.C. in arranging for the exhibition to be held.

Realising that three lectures, no matter how excellent in themselves, cannot possibly cover all the ground, *Flight* is publishing this week a series of articles by experts in many phases of airport design, equipment and operation. These articles will supplement the papers to be read at the conference, and in addition, the references to firms which manufacture equipment or otherwise do work connected with airports will form a useful guide to any township or municipality which is beginning to interest itself in the possibilities of establishing their own aerodrome.

Single-engine Psychology

SUCH enormous ranges are being claimed for some of the new single-engined bombers that it makes one wonder what effect these capabilities would have on the *morale* of their crews in war time.

The American Vultee V-11, according to its makers, will do 2,200 miles with full bomb load, and something superlative may be looked for from certain British types now on the stocks.

Suppose that a bomber with a single engine is capable of flying for over 2,000 miles, and is engaged on a long-distance raid. It is quite conceivable that a very large portion of the outward trip—perhaps 1,000 miles—would be over enemy territory and engine failure would mean a certain landing behind the lines.

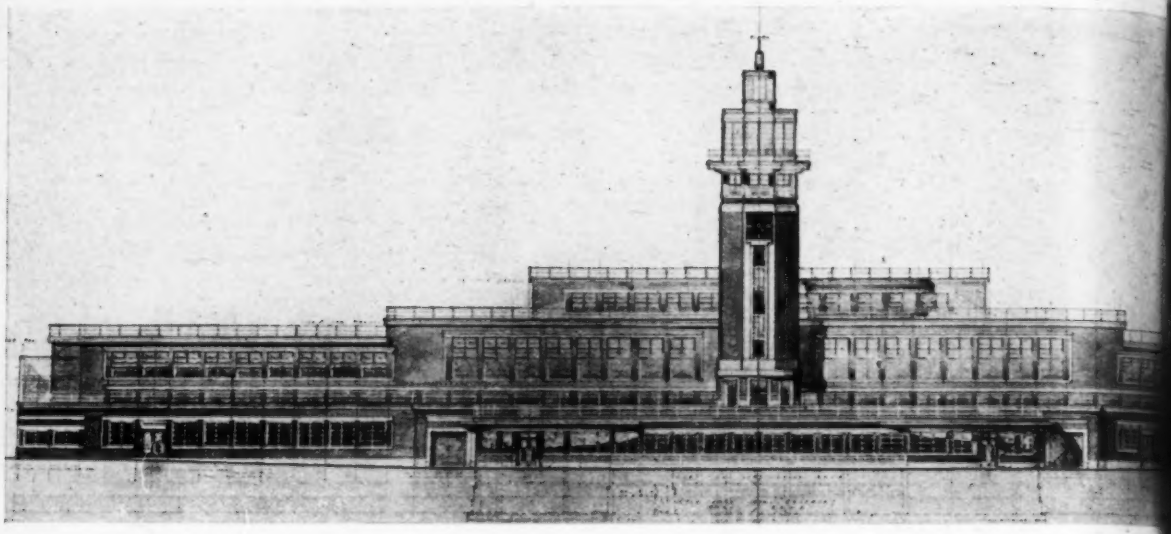
It might be found, in fact, that the advantages in range bestowed by the single-engined type would not offset the inevitable reaction on the *morale* of the men who would fly it. To say that is no reflection on their courage; but one cannot ignore the elementary laws of psychology.

Emergency Exit

A DEMONSTRATION, no less welcome because it was unpremeditated, of the possibility of getting out of a cabin aeroplane during a spin was given by Wing Commander Stent in the Reading district last week. The machine was the first of the new Miles Nighthawks, to which reference has previously been made in *Flight*, and the flight was to be the last of a series of test flights for the Air Ministry. The pilot had no difficulty in getting the door open, nor in getting clear of the machine. In this connection it seems well worth recalling that the Nighthawk has a door arrangement similar to that used in the Falcon, viz., the doors hinge along their top edge and are opened by being lifted upwards. It appears probable that, had they been hinged along the front edges difficulty in opening them during the spin might have been experienced.

Lest unfair conclusions should be drawn from this episode it is worth mentioning that the Nighthawk had previously been spun in both directions many times with the centre of gravity in the extreme rearward position demanded, and there had been no difficulty in getting it out of the spin. On this occasion, however, the c.g. had been shifted back ten per cent. behind the rear limit set down by the design, and the spin was a prolonged one, which became flat, and continued, in spite of everything the pilot could do. After something like twenty-five turns, he transferred to his Irvin and landed safely. The machine landed flat, and was less damaged than might have been expected.

In its normal work the Nighthawk could never accidentally be put into the position brought about by these artificially introduced circumstances; in fact, several pilots have experienced difficulty in getting it to spin at all in this condition.



Liverpool's projected airport building—"a large and dignified scheme, somewhat marred by the excessive emphasis of its central feature . . . a rather unnecessary clock tower."

ARCHITECTURE

The Trend of Design To-day as Disclosed or in Process of Des

By JOHN DOW

JUST as the design of aircraft has a compelling fascination for the most adventurous minds in mechanical engineering, so for the architect and the constructional engineer the design of airports and their buildings has presented problems of unusual interest, tempting many into the preparation of elaborate schemes—usually for uncertain or imaginary clients and too often without any prospect of even partial execution. In few fields of constructional effort have recent years produced more thinking or less tangible achievement to show for it. It has been enough that the subject-matter has been new, free from the deadening hand of established style and precedent, and therefore demanding a return to first principles and an unfettered imagination.

Mr. John Dower, M.A. (Cantab.), A.R.I.B.A., the author of this article, played a very important part in pioneering modern airport design in this country. He was Secretary of the R.I.B.A. Aerodromes Committee.

But the last year of more securely re-established prosperity promises a heartening change. Many schemes long brewing—for the opening-up or development of airways, for the establishment of new airports and landing grounds, and for the erection of new or enlarged airport buildings—are now well under weigh; and many more are promised for the coming months. Those who did the thinking in the years of depression are earning—and it may be hoped will more fully earn—a just reward.

Six years ago, when, as secretary of an investigating committee, the writer first became interested in the design of civil aerodromes and their buildings, there were only two existing models in Great Britain worthy of examination—the massive and official Croydon, much as it looks to-day, though less fully equipped with aids to navigation—and Heston, entirely surprising as a private venture in face of innumerable difficulties, but as yet modestly confined to its first bow-roofed concrete hangar and a small but attractive club-house.

Visits to these were followed, in the next three years, by several tours to inspect the chief Continental airports and by the accumulation of a large collection of photographs and notes about existing and projected airports in all parts of the world, but especially in the United States, where an "airport boom" was then in full swing. These

An interesting V-type layout—that of the new airport buildings at Lyon. The station building offers easy access to a number of aircraft at the same time.

of the AIRPORT

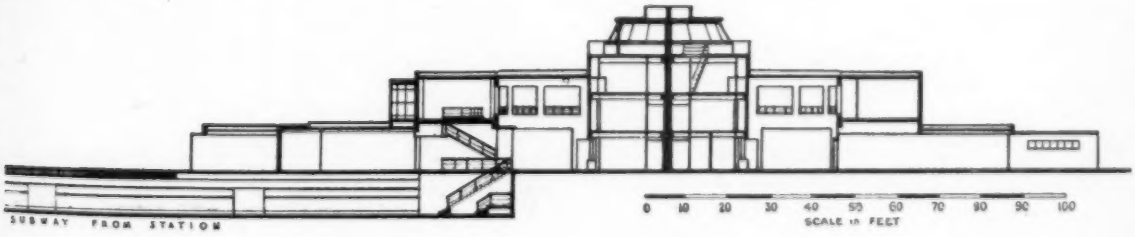
Some of the Buildings Under Construction Home and Abroad

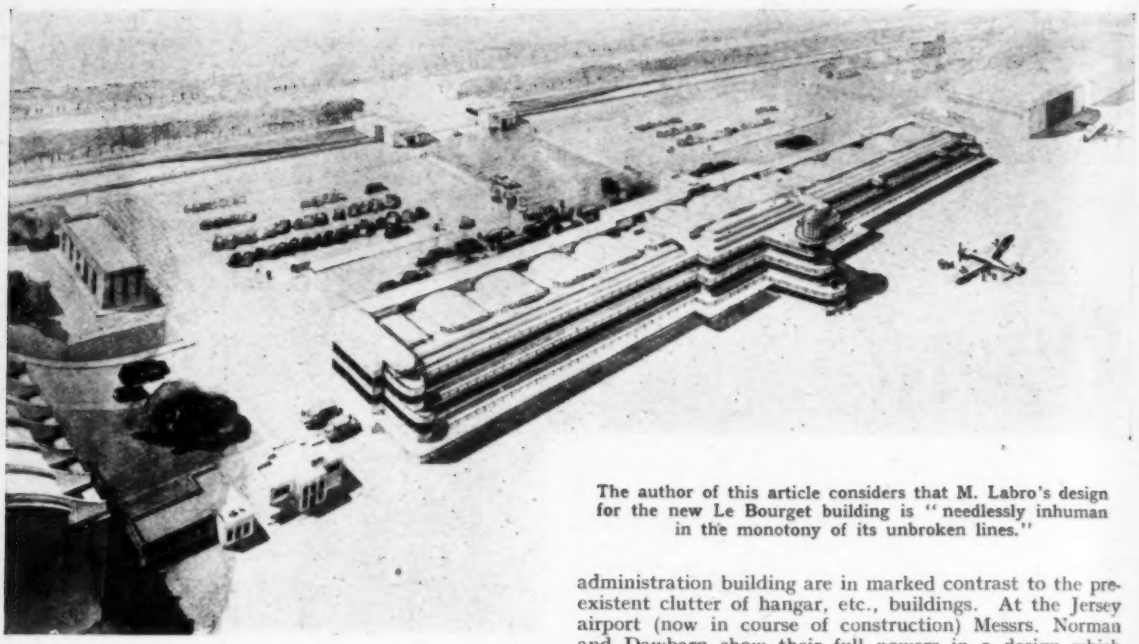
I.A.(Cantab), A.R.I.B.A.

enquiries were an eye-opener in more ways than one. It was clear that nearly everywhere the development of civil air transport was being seriously held up by inadequacy and inefficiency of ground equipment. It was equally clear that, of the principal countries of the world, Great Britain, so far from being the best equipped, was among the worst. In the layout and design of buildings the airports of Berlin, Hamburg, Munich, Amsterdam, Lyon, and half a dozen other great cities in Europe and America were already well ahead of us in technique, and threatening to go still farther ahead.

The threat has not materialised to the extent then feared, because the "economic blizzard" intervened. The airport boom in the United States collapsed, and a thriving profession of airport engineers and architects was reduced to an underworked handful. Developments in European countries, though not so spectacularly cut short, were everywhere postponed or restricted. Work was equally held up here, but the delay gave opportunity for catching

(Above) Clean and pleasing club-house design, as exemplified at Brooklands.
(Left) A bold experiment in design—the new Gatwick airport with its "Martello tower" air passenger station connected with the railway station by an underground passage. The layout is shown in the drawing below.



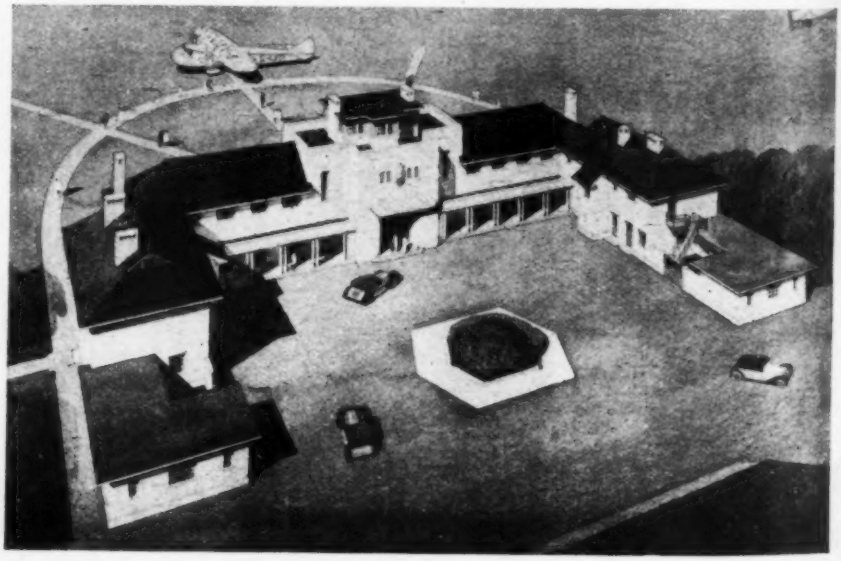


The author of this article considers that M. Labro's design for the new Le Bourget building is "needlessly inhuman in the monotony of its unbroken lines."

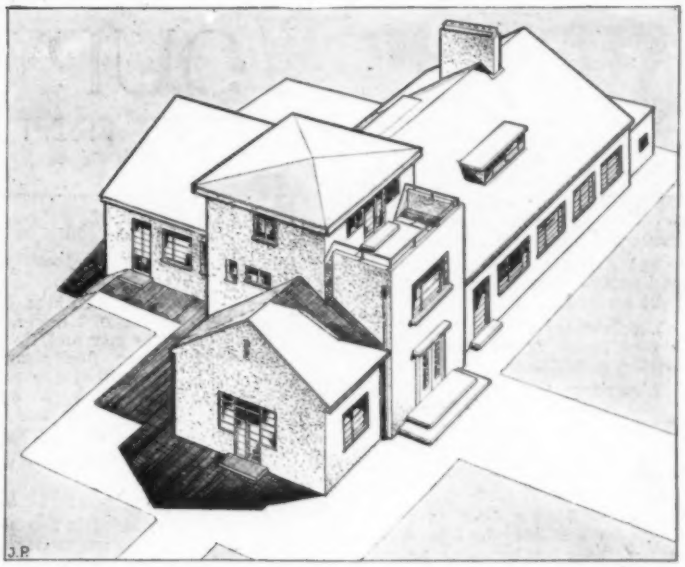
up with foreign technique. The opportunity has not been missed, and it can now be confidently claimed that Britain and the Empire have a small but competent band of airport designers and consultants and a growing number of airport construction schemes in course of realisation, both fully up to the standard set by other countries.

Outstanding among the British thinkers and executants have been Messrs. Norman and Muntz, the adventurous creators of Heston airport, and Mr. Graham Dawbarn, who has since joined them as architect on the consultant side of their work. To Messrs. Norman and Dawbarn (Mr. Muntz has recently left the partnership to take up other work) grateful acknowledgment must be made for several of the illustrations accompanying this article. The advantage provided by the possession of Heston as a field for trying out theories of design, equipment and traffic regulation has been fully realised by the partnership, and has unquestionably contributed to the consistently realistic character of their work As an architectural whole, Heston is perhaps the least convincing of their schemes—not unnaturally, when every building has been the experimental trying-out of one or many new ideas. Moreover, Heston itself is a very composite experiment—at once a flying club headquarters, a flying school and a public air terminal for London. The club motive seems to predominate in the buildings, though the large new steel-framed hangar gets the scale and character of a major airport.

The club motive again predominates at Brooklands, where the clean lines and logical form of the club and administration building are in marked contrast to the pre-existent clutter of hangar, etc., buildings. At the Jersey airport (now in course of construction) Messrs. Norman and Dawbarn show their full powers in a design which embraces all the requisite buildings in one unitary scheme. Æsthetically, the scheme shows a masterly handling of one of the airport designer's basic problems—that of giving a common scale and character to buildings so widely different as a terminal station and hangars. On the practical side, the scheme seems likely when completed to be equally satisfactory as a solution, within its limits of size, of the other basic problem—the easy interconnection, rapid circulation and safe control of traffic from ground to air and air to ground. Among the many other interesting schemes which this firm have prepared, the terminal building at Perth aerodrome (shortly to be completed) and the projected terminal building at Lusaka, Northern Rhodesia, shows special points of interest; the former as adapted to the special purposes of a base for the training of reserve pilots in addition to normal civil use; the latter as a simple but attractive solution of the special needs of the typical calling station on long-distance Imperial air routes, as may be seen from the aerial view below.



Specially laid out as a "port of call" on the Empire routes—the terminal building at Lusaka, Northern Rhodesia.



A pleasing example of design for the smaller type of municipal airport—the Perth aerodrome building.

It is probably generally agreed that the critical element in airport design (assuming that the airport site has been wisely chosen) is the relation between the buildings, whether grouped or distributed, and the aerodrome proper, i.e., the landing and rising space. Safety is clearly the first requirement. The buildings must be so placed and so limited in height that they do not impede or endanger the manœuvring of the largest anticipated volume of air traffic in any reasonable flying weather. But speed in the circulation and interchange of traffic is equally important, and if safety tends to push all buildings away from the perimeter of the aerodrome, speed tends to pull them to its centre. At the same time, both forces act to some extent in the opposite direction, for (other things being equal) the safe and efficient control of an aerodrome's traffic is best carried out from some comparatively central point, while speed on an aerodrome is a function not only of the air traffic at its centre but also of a varied ground traffic which must normally concentrate at one or more points on its perimeter.

Rival theories have been evolved. The simplest visualises a flying field of roughly circular form with the buildings arranged along a chosen section of its circumference; if the buildings are extensive, they are probably divided up into two or three groups with "flying-gaps" in between them. Of this type the Hamburg aerodrome is the most complete and probably the most successful example. Its finely massed and terraced station building, with its central control turret, would appear to have been taken as prototype for the station building now projected for the airport of Liverpool—a large and dignified scheme, somewhat marred by the excessive emphasis of its central feature, in which the necessary control turret is magnified into a rather unnecessary clock tower. Another design on this pattern is the still larger new station building for Paris (Le Bourget) airport, the construction of which is about to be begun. The very heavy traffic doubtless demands a building of this vast bulk, but the monotony of its unbroken lines of windows seems needlessly inhuman, and it seems doubtful whether there is convenient provision for the rapid simultaneous loading or unloading of several large aircraft.

The airport of Lyon is the prototype for another theory of design. In this the buildings are arranged in V-shape, jutting out into the aerodrome with the station building at the head of the V. The control point and the centre of traffic interchange are thus brought closer to the centre of flying operations, while the station building can conveniently be given two or even three faces to the aerodrome, and thus increased scope for simultaneous connection with several aircraft.

A third and more revolutionary theory of design is now being tried out at Gatwick airport. This boldly places the station building out in the field as a circular "Martello" tower with access to and from aircraft on every side. An underground passage connects the station with the railway and road approaches. In the station a central "concourse" surrounded by offices, restaurants, etc., connects with three entrances from arriving aircraft and three exits to departing aircraft. Each passage-way terminates in a telescopic gangway and could readily be adapted in the future to branch into two or even three such gangways. It is far too early to judge whether this building, which is to be opened in May, will become the regular model for the major airports of the future, but, for all the detail inconveniences involved by planning on the circle, it certainly represents a substantial advance towards the solution of some of the requirements of airport design.

Jersey's new airport buildings, now in course of construction—"a common scale and character given to buildings so widely different as a terminal station and hangars."

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

PRODUCTS of nearly a hundred firms of interest to the potential aerodrome owner are dealt with in this issue.

The American Ford Company is experimenting with a 115 h.p. two-seater light aeroplane.

The Governor of Cyprus is taking steps toward providing the island with more landing grounds.

About 130,000 people have visited "The Empire's Airway" Exhibition at the Science Museum, Kensington.

On an average, every aeroplane belonging to a British subsidised club flew 335 hours during 1935.

The Brooklands Club averaged 646 hours per machine, the Hampshire Club 410, and the Scottish Club 405.

Maurice Rossi, using a Caudron Typhon, will attempt a solo flight from Paris to New York and back in 48 hours.

British exports of aeroplanes, engines and parts (excluding magnetos) for 1935 reached a new high level of £2,680,729.

This beats the previous record figure (1929) by more than £500,000; it is nearly double the 1933 (low level) total.

Mr. Eugene Vidal has recommended to Congress expansion of machines and personnel to keep pace with air defence plans abroad.

A Russian P-5 mail carrier, towing a glider, will attempt to fly the 10,066 miles from Moscow to Kharbarovsk and back this month.

Twenty-five Years Ago

From "Flight" of January 28, 1911.

"Rising from Selfridge Field, near San Francisco, Mr. Ely, after flying over the city and the warships in the Bay, finally came to rest on the deck of the cruiser *Pennsylvania*, where a special landing superstructure had been previously erected.

U.S. Bomber Accident

Six men were killed in a collision between two U.S. bombers in Honolulu last week. Two escaped by parachute.

Sporting Lines

The new "hush-hush" Mureaux 300 m.p.h. single-seater fighter, with a 450 h.p. Salmson engine, is said to resemble in appearance a Coupe Deutsch racer.

Miss Betty Malcolm

Flight regrets to record the death, in an accident in Spain to her private aeroplane, of Miss Betty Malcolm, daughter of General H. H. L. Malcolm, of Bournemouth. She was said to have been preparing for a solo flight to Australia.

Airway Exhibition for S.A.

It is understood that Imperial Airways may send the complete Empire Airway Exhibition (coming to a close tomorrow at the Science Museum, South Kensington) to the Empire Exhibition which is being held in Johannesburg at the end of this year.

Clocking In

When the airport lighting system failed at the Union Air Terminal in Burbank, California, the field electrician found that a woodpecker had drilled full of holes the door of the cabinet containing the time mechanism clock, upon which he was calmly perched.

Competitive Success

The recent U.S. competitions for bombers and attack machines have resulted in an order being placed with the Douglas Company for 90 bombers of the type shown in *Flight* of January 9 and with the Northrop Corporation for 100 attack machines with Twin Wasp Junior engines. The order for thirteen Boeing 299s has already been recorded.

Heinkel Variety

Apart from He-70A's and the oft-illustrated single-seater fighter biplanes, Heinkels are producing a twin-engined bomber with 900 h.p. supercharged engines, a training seaplane, a high-altitude observation biplane with a Siddeley two-row engine, and a dive bomber—believed to be intended for Austria—designed to load factors of 16. Another type—the twin-engined commercial 111—was described in *Flight* of January 16.

FIRST OFF THE LINE: Here is the first production-type Fairey Swordfish torpedo spotter reconnaissance machine during tests at the Fairey aerodrome last week. The Swordfish is fitted with the 690 h.p. Bristol Pegasus III moderately supercharged radial: its airscrew is a three-bladed metal Fairey.

OPERATING A MUNICIPAL AIRPORT

Yeadon—the municipal airport of Leeds and Bradford.

Apparently Obvious Factors that are Sometimes Neglected by Local Authorities : Co-operative Methods of Administration in the Early Stages : The Airport as a Business Concern

By R. ASHLEY HALL, Chairman of the Airports Conference

IN considering a sensible policy to be adopted by a municipality for the administration of an aerodrome it is well to have clearly in mind the reasons that have led to the establishment of that aerodrome.

These reasons are, presumably, that the local authority has been far-seeing enough to take the responsibility of ensuring that its citizens shall have available the means of using air transport to and from their town as and when they require it. Without the aerodrome such facilities could not exist.

Every town and city, be it a holiday resort or an industrial centre, will find that the necessity of being in air contact with other centres will grow as the years pass, and ratepayers who find themselves isolated through lack of a flying ground will have a very legitimate complaint against their councillors.

So now let our imaginary council say to themselves: "We will provide whatever facilities are necessary for aeroplanes to fly to and from our town." They will find that they have to provide a landing area of such-and-such a size, some hangar accommodation for the housing of visiting aircraft and aircraft that may make this aerodrome their headquarters, a petrol and oil station, floodlighting equipment, and a building to accommodate administrative offices, waiting-rooms, cloakrooms, etc., for the comfort and convenience of passengers and pilots using the aerodrome. Whether the administration building is an elaborate affair, providing for Customs, aerodrome control, restaurants, etc., or a small temporary building to serve immediate needs, will, of course, depend on the particular centre. The above-mentioned items are, however, the essentials required, and, when they are provided, the district in question will be in a position to make use of air transport.

So now we reach the stage when a municipality is the owner of an aero-

A practical pilot, Mr. R. Ashley Hall is a member of Bristol Council, Vice-Chairman of the Municipal Airport Committee, Chairman of the Airport Management Committee, Chairman of the Bristol and Wessex Aeroplane Club, and Chairman of the Airport Operations Division, Air Transport Section, S.B.A.C. He is also an officer of No. 501 (City of Bristol) (Bomber) Squadron.

drome—a trading concern—and the councillors must decide on a policy for the carrying on of this business.

I would respectfully suggest that, having provided the aerodrome and the essentials in the way of equipment, their best policy is to regard themselves as landlords of a trading centre, and leave the actual commercial activities to private enterprise. For example, as the business of air transport grows, so will there be a demand at aerodromes for hotel and restaurant accommodation; the municipality can then rent a site adjoining the aerodrome, where private enterprise can carry out this business.

A demand will arise for repair and maintenance workshops; the aerodrome owner can again rent a site or let accommodation in their existing hangars to a commercial company wishing to engage in this enterprise. Air-line operating companies may wish to make this aerodrome their headquarters and to rent from the aerodrome owner hangar space in which they can house their aircraft and carry out their own repair and maintenance work.

There is also likely to be a demand for a flying school. This latter work, in my opinion, should be carried out by a responsible aeroplane club. It is a great advantage to have such a club at a municipal aerodrome. Clubs provide the social atmosphere and foster local interest in the development of aviation, thus indirectly assisting in building up the business of air transport and, consequently, the business of their town's aerodrome. A club should become a tenant of the aerodrome owner, but, in view of the propaganda work it carries on, should be given very privileged terms. It should also be enabled to have a clubhouse and social centre, and should be allocated the sole rights of giving flying instruction. I suggest that this be the *only* monopoly; one flying school is sufficient at any one place, and, also, a flying school must be under the control of a responsible body. In return for privileged terms and the flying instruction monopoly the club should agree not to compete with commercial concerns in such activities as engineering and repair work, air taxi charter, etc. If it prefers to engage in such activities it should forgo its privileged terms and pay rent on the ordinary commercial basis.

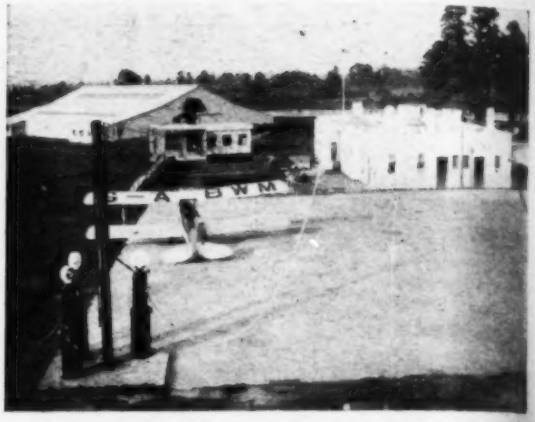
Sources of Revenue

Thus, as the business of flying develops, will the aerodrome "landlord" obtain a return in the form of rentals from commercial concerns trading on his site. At the same time, he will receive from aircraft using the aerodrome a return in the form of landing fees, dues on passengers embarking and disembarking, and freight loaded or discharged. He will also receive "garage" receipts for aircraft housed in his public hangars.

A simple and serviceable method for the basing of landing fees, dues, housing fees, etc., has been prepared by the Aerodrome Owners' Association and is recommended for general adoption.

It must always be remembered that the first and foremost reason for providing an aerodrome is to give local residents the facilities of flying to and from anywhere they wish; so, in their interests, the aerodrome owner should encourage the use of his site by every air line and casual air taxi possible, the aerodrome being "open to all" in the truest sense.

Next we turn to some of the practical details of day-to-day management. The responsibility for the direction of policy of a municipal airport should be undertaken by an "aerodrome committee" of the council. The actual administrative staff, even at a centre where the traffic is still limited, must have at its head an individual of some standing, capable of taking responsibility, of acting as manager, and of seeing that the wishes of the aerodrome committee are carried out. Some clerical assistance is necessary, together with a hangar staff to handle aircraft, operate the petrol station, keep the place clean and look after the first-aid and fire-fighting equipment, etc. At a large and important centre, where considerable air traffic is already enjoyed, all the above-mentioned staff, deputy manager, and aerodrome control officials, as they become necessary, should be corporation employees.



Bristol airport is an example of club and municipal co-operation. This snap shows the clubhouse, passenger station (in course of erection) and Airwork service hangar.

In these early days, however, economies may be effected by entering into a co-operative arrangement with some other body to carry out the day-to-day operation and administration. For example, at certain municipal aerodromes, where the volume of traffic has still been small, an excellent arrangement has been for the corporation to employ the local aeroplane club to carry out these duties, the club secretary acting as manager, and the club ground staff acting as hangar personnel, all working on behalf of the corporation and carrying out the policy as laid down by the aerodrome committee.

In other instances agreements have been entered into between corporations and commercial aircraft companies whereby the latter provide the necessary administrative staff. This scheme can work extremely well, but, naturally, the terms of such an agreement need particular care so that the interests of the aerodrome are protected; the commercial aircraft operator must not abuse his position by selfish action in discouraging the use of the aerodrome by others, to his own advantage, yet to the disadvantage of the development of the airport as a whole.

My own opinion is that such co-operative agreements for the purpose of providing economical administrative staff are excellent in the early days of an airport's existence, but should be of a temporary nature only. Airport operation is a serious business, and the corporation should appoint its own official manager as soon as traffic has increased to a reasonable extent. In the interests of economy it may still be found convenient to continue with some form of co-operative arrangement whereby an outside body provides the lower-grade personnel until such time as it is desirable to employ a whole staff direct; but the authority should have its own manager, whose sole interest is the success of the airport and who will be directly responsible to the aerodrome committee.

The city engineer's department may carry out initial work for the aerodrome committee—work such as levelling, draining, and building maintenance—but I do not think that the city engineer should be expected to manage the aerodrome subsequently.

A final word: Vision and foresight are needed in the administration of airports. Aviation is still a new industry, and what may seem tempting to-day may be a liability to-morrow. Also, the aerodrome proprietor must always be a little ahead of the demand. Air-line services cannot start to operate until landing grounds are available, they cannot operate at night until floodlighting equipment has been installed, and they will be hampered in bad weather until wireless is in more general use. This may mean that for some years to come the expenditure of an aerodrome will also be ahead of the receipts; but the local authority must look ahead

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —

SOUTH AFRICA'S NEWEST : Rand Airport, Johannesburg, as it appears in diorama form at the Empire exhibition, which closes to-morrow night. This new terminal airport was described and illustrated in *Flight* of September 5 last year. (*Flight* photograph.)

THE WEEK AT CROYDON

Croydon in Mourning : Notabilities by Air : New Douglas Machines for K.L.M.

THE grief which overshadowed the Empire made itself felt at Croydon, and it was interesting to see how many foreign air travellers were to be seen with some badge of mourning. The first aeroplane with its flag at half mast which caught my eye, too, was a D.L.H. Junkers Ju. 52.

One day last week, incidentally, the D.L.H. night freight service was duplicated, and on another occasion it was triplicated to carry special importations in connection with the period of mourning.

Last week Lord Lloyd, who is a Privy Councillor, arrived from Paris by Imperial Airways at 3.5 p.m. with exactly 55 mins. to reach London, change into the appropriate dress and to attend a Privy Council meeting. The circumstances were wirelessed from the machine to the Control Tower, and the various officials concerned swiftly completed the necessary customs and passport business. Before the engines of the aeroplane had ceased to run on the tarmac Lord Lloyd was on his way to London by special car. Quick work.

Capt. Chattaway Leaves

Everybody at Croydon will be very sorry to lose Capt. Chattaway, who is leaving to take up an important position at Singapore. He is to be Aviation Officer, Public Department of Works, Straits Settlement. "Chatters," as he is called at Croydon, is one of the pioneer air line pilots of this country, having been with Instone Air Lines when that company was founded in the very earliest days of civil aviation. He used to fly the old Vickers Vimy which, incidentally, ended its days as a summer house in the garden of another Croydon old-timer. In 1922 Chattaway joined the Air Ministry and has been at the Airport of London ever since.

He has done much in an unobtrusive way—so unobtrusively indeed, that his good work has not always been fully recognised—to build up the whole complicated organisation of the airport and of the traffic control system at Croydon, which is acknowledged to be the best organised control in Europe. By his tactful handling of difficult situations, by his understanding of the needs of the commercial community, and by his sympathetic attitude towards harassed individuals he has done more to deserve the gratitude of his superiors than many of them are ever likely to understand. Unobtrusively "Chatters" did his job, and unobtrusively he has melted away from Croydon, but those who have worked with him daily for something like a decade and a half will always keep a warm corner in their hearts for him.

The good wishes of the Croydon heads of departments, British and foreign, go with him to his new job. Incidentally, there was a very informal ceremony in the Aerodrome Hotel before he left, when two of the oldest hands at the airport, the managers of Air France and K.L.M., cornered the reluctant "Chatters" and told him what they thought of him and of the magnificent co-operation they had invariably received from him.

On Saturday afternoon Prince Seid el Hussein of Iraq arrived for the Royal funeral by K.L.M. from Berlin. Though the B.B.C. enumerated the various notabilities who had arrived by sea, escorted by destroyers—presumably because ships are so unreliable—and by special train—because you never know with ordinary trains—there was no mention of this Prince who came by air. On Sunday night, however, it certainly was announced that Field-Marshal Baron Gustav Mannerheim, Liberator of Finland, had arrived by air. This was a matter which could hardly be ignored, for there were no fewer than six shining top hats on the tarmac to meet Finland's representative at the Royal funeral.

Incidentally, by the same blue and silver Fokker F.22 came the Hereditary Grand Duke of Hesse, travelling so

strictly incognito that he insisted on standing in the ordinary queue for passports and on going through customs formalities in the normal way. One amusing point about the Liberator of Finland's arrival, by the way, was that on his emigration card the enquiry, " Profession or Occupation? " was answered by the words " Field-Marshal."

Sunday afternoon provided another excitement when Mr. Leo Crilly arrived in triumph with the first of his four Fokker F12 machines, painted in his own colours and duly registered as G—ADZJ. The other three F12 machines are expected at Croydon shortly.

K.L.M., by the way, has ordered three new and improved Fokker-Douglas D.C.2 machines in readiness for next summer season. They are to be fitted with Goodrich de-icers and a revised and improved cabin heating installation is to be arranged.

For King George's funeral on Tuesday arrangements were made whereby several air services which were due to leave at 1.30 p.m. or thereabouts waited until after the two minutes' silence, passengers and staff standing bareheaded in the main hall during that impressive cessation in the day's activities.

A. VIATOR.

The Empire Air Base

TENTATIVE discussions between the Portsmouth Corporation and Imperial Airways suggest, nevertheless, that the projected Empire air base may be established in Langstone Harbour, adjacent to the Portsmouth Airport.

Croydon's Boundary Lights

STARTING at sunset to-morrow, the boundary lights of Croydon Airport will be fixed in character instead of simultaneously acculting as at present. In other words, they will no longer " blink."

Qantas Efficiency

DURING the period between December 10, 1934, when the Singapore-Brisbane service was opened, and November 30, 1935, Qantas Empire Airways machines have flown 605,173 miles without a forced landing, and 2,075,707 engine-miles with only one case of mechanical trouble. This company has a ten-hour inspection scheme, and people who are in the habit of seeing the Qantas section of the Empire route as part of a world map will possibly be surprised to learn that the distance between Brisbane and Singapore is as much as 4,361 miles.

Radio in the Channel Islands

A DELEGATION of Channel Islands officials, headed by the Bailiff of Jersey, recently attended a conference at Gwydr House to discuss the plans for the establishment of adequate D/F facilities. With the completion of the aerodrome on Alderney and the approaching completion of Jersey's airport the position is a crucial one.

At present it is proposed that the principal station shall be erected on Alderney with minor stations on Jersey and Guernsey, so that no interference between them would be possible

The Scandinavian Contract

MORE or less simultaneously with the official announcement that this company has obtained the mail contract for Scandinavia, British Airways officially opened its new headquarters at Terminal House, Grosvenor Gardens, S.W.1.

Not only is the new head office decorated in attractive modern style, with " window dressing " in keeping with the importance of British Airways in the air transport business, but it is also conveniently central and immediately beside Victoria Station. The importance of this position is obvious when it is remembered that the company will be operating from the new Gatwick airport (illustrated on p. 101) just as soon as this is ready. Gatwick has its own railway station, which will be reached in less than forty minutes by the Southern Railway electric train service from Victoria.

De Havilland 86A's will be used on the Scandinavian service, which will probably be opened within a few weeks. These machines will be fitted with all the latest instruments, including P.B. automatic pilots, and there is a possibility that complementary Lorenz equipment will also be installed, since several airports on the route have Lorenz blind landing systems.

British Airways' machines at present fly to Paris, Brussels and Antwerp, apart from the internal services which had been separately operated by the three merger companies.

Last week Major McCrindle, Capt. Stack, and Mr. Banks, the traffic manager, left in a B.A. machine for Malmö, which was reached in 5¼ hours, including a stop at Amsterdam. The actual route will be *via* Amsterdam and Hamburg to Copenhagen and Malmö, and it is expected that a night service will be operated during the summer months. Two pilots and a radio operator will be carried.

Progress

THE Air Ministry has recently issued its quarterly list of actual and prospective municipal airports with the eighty-eight towns in the " interested " category, they make a grand total of 242. Four more municipalities have seen the light since August of last year, when the list was published for the last time.

Towns which have licensed aerodromes (Total 27).—Blackpool, Brighton (with Hove and Worthing), Bristol, Cardiff, Carlisle, Doncaster, Grimsby, Hull, Inverness, Ipswich, Leeds and Bradford, Leicester, Liverpool, Manchester, Newcastle-upon-Tyne, Norwich, Nottingham, Plymouth, Portsmouth, Ramsgate, Renfrew, Rochester, Scarborough, Southampton, Southend, Stoke-on-Trent and Walsall.

Towns which have purchased sites (Total 11).—Belfast, Birmingham, Bury St. Edmunds, Cheltenham and Gloucester, Coventry, Hastings, Perth, Southport, Wolverhampton, Worcester, and York.

Towns which have reserved sites in their Town Planning Scheme (Total 4).—Blyth, Burton, Rotherham, and Skegness.

Towns which have sites inspected (Total 112).—Aberdeen, Abergavenny, Aberystwyth, Aldershot, Aylesbury, Barnet, Barnsley, Basingstoke, Bath, Bedford, Berhill, Bideford, Blackburn and Preston, Bognor, Bolton, Bournemouth and Poole, Birkenhead, Bridlington, Burnley, Cambridge, Chelmsford, Chester, Chorley, Colchester, Colwyn Bay, Consett, Crewe, Cromer, Darlington, Dartford, Derby, Dundee, Eastbourne, Edinburgh, Exeter, Falkirk, Gateshead, Glasgow, Grantham, Gt. Yarmouth, Greenock, Guildford, Halifax, Harrogate, Harwich, Haverfordwest, Hereford, Hitchin, Huddersfield, Huntingdon, Huyton, Ilford, Ilfracombe, Irvine, Kendal, Kidderminster, King's Lynn, Kingston-on-Thames, Kirkwall, Lancaster and Morecambe, Leek, Lincoln, Littlehampton, Loughborough, Luton, Lymington, Lytham St. Annes, Maidstone, Middlesbrough, Middleton, Minehead, Motherwell, Newport (Mon.), Newton Abbot, Northam (Devon), Northampton, Oswestry, Oxford, Peterborough, Redditch, Rochdale, Sheffield, Shetland, Shrewsbury, Slough, South Shields, Southwold, St. Albans, Stirling, Stockport, Stornoway, Stratford-on-Avon, Sunderland, Swansea, Swindon, Taunton, Thurso, Torquay, Tow Law, Tynemouth, Walthamstow, Warrington, Warwick, Watford, Wellingborough, West Bromwich, West Hartlepool, Weston-super-Mare, Weymouth, Winchester, Windermere and Woking.

B.C.A. Go Ahead

SINCE British Continental Airways became members of the International Air Traffic Association, several important forward strides have been made.

The company has just acquired control of that well-known organisation, Rollason Aircraft Services, to the board of directors of which Mr. F. W. Jones and Mr. J. R. Bryans, of B.C.A. have been appointed. This acquisition involves, of course, the complete servicing of B.C.A.'s machines on Scandinavian and European routes, not only at Croydon, but also at Doncaster, where Rollasons have a branch establishment. Capt. Rollason naturally retains an interest in the company which he founded.

It will be recalled that about a month ago the London-Scandinavian route was surveyed by one of the B.C.A. aeroplanes on board which were Sir Percy Mackinnon and Mr. F. W. Jones. This flight established relations which have now borne fruit at a date which, curiously enough, coincides with another survey flight to Scandinavia by a different company.

Permission has now been granted to British Continental Airways by the different Governments concerned for services from London, *via* Amsterdam and Hamburg, to Copenhagen and Malmö, with an eventual connection with Stockholm as soon as the new airport there is ready for use. The Scandinavian service, it is understood, will be opened in February.

Another interesting item of B.C.A. news is that the Hon. A. A. Morton Weir, the son of the Lord Inverforth, will join the board shortly, and it is expected that the powerful financial interests behind this company will eventually bring about a closer association between air transport and the more important shipping companies.

When shipping and aviation go hand in hand the " younger son " of the great transport family may be said to have come of age at last.

An Association of Ground Engineers

THE inaugural meeting of the Association of Ground Engineers will be held at the Horse Shoe Hotel, Tottenham Court Road, London, W.1, on Thursday, February 6. It is hoped that a good number of ground engineers will turn up and an organising committee will be appointed.

Pilots for India

IT is learnt that Indian National Airways have reason to hope for substantial Government support in the near future and that the consequent expansion of business will call for an increase in their staff of pilots. "B" licence pilots, in possession of the 2nd class navigator's licence and, if possible, a W/T operator's licence, who are interested in this possibility, should apply to Airwork at Heston, who have instructions to interview pilots on behalf of their Indian associates. One of the positions to be filled is that of personal pilot to the Viceroy, whose Avro 642 monoplane, the *Star of India*, is maintained and operated by I.N.A.

Three Fast Feeders

BURNELLI AIRCRAFT, Ltd., Grow, Joy and Co., and the Kinner Airplane and Motor Company have each issued information concerning their entries for the competition for twin-engined six-seaters organised by the U.S. Department of Commerce. The Burnelli is a cantilever monoplane with two 200 h.p. Menascos, and embodies the features peculiar to Burnelli design; Grow, Joy and Co. are submitting a more conventional low-wing monoplane with a pair of 320 h.p. Whirlwinds; and the Kinner, another low-wing type, uses two Kinner engines of 370 h.p.

The respective maximum speeds are estimated to be 186 m.p.h., 192 m.p.h., and 211 m.p.h. The specification called for 175 m.p.h.

The London-Madrid Service

AIR FRANCE announce that, as from April 18 next, a daily service will be put into operation bringing Madrid and the holiday resorts of Seville and Valencia within a day's journey from London.

For the past six months a weekly passenger service has been maintained between Paris and Madrid (running every Thursday) through the co-operation between Air France and L.A.P.E. Air France have been using Potez 14-seaters on this route and L.A.P.E. have employed Douglas D.C.2's.

On April 18 the service will be extended to London, and connections at Madrid will be established with new feeder services plying between Madrid and Seville and Madrid and Valencia. The time of departure from Croydon will be 8.45 a.m. Madrid will be reached at 3 p.m., and Seville and Valencia will be reached at 6 p.m.

An S.43 for K.L.M.

A SIKORSKY S.43 amphibian, with two 750 h.p. Pratt and Whitney Hornets has been ordered by K.L.M.. Six similar machines are being built for Pan American Airways, three for Marline Airlines—a new company operating between New York and Boston—and for more than one other European concern.

A Better Yeadon

PLANS for equipping the Leeds-Bradford municipal aerodrome at Yeadon for day and night air services are to be prepared by Messrs. Tiltman and Volk. At a meeting of the Leeds-Bradford Joint Aerodrome Committee, which they attended, they were asked to prepare a scheme for aerodrome improvement. The committee also decided to accept the offer of the Air Ministry to install D/F apparatus and teleprinting instruments to establish communication with Barton (Manchester). The aerodrome is expected to be enlarged to twice its present size.

Rapid Replacement

TWO days after on Air Dispatch D.H. Dragon had been forced down in the sea at Ault the machine had been temporarily replaced. An Airspeed Envoy, which is the only British type of commercial aircraft to be fitted with night flying equipment as standard, was flown from Portsmouth to Croydon at 1.10 a.m. on January 24, where it was loaded with freight and newspapers and flown on the Paris service.

It appears that while Mr. Jackson was flying back from Le Bourget at 2 a.m., after taking over a load of gold, the machine was struck in a freak thunderstorm and all the electrical gear was put out of action. Mr. Jackson put the Dragon down safely in three feet of water near the Ault lighthouse. If this sort of thing happens often we shall begin to think that the whole of nature is arraigned against the aeroplane as a means of transport.

Meanwhile the war (Air Dispatch v. the rest) joyfully continues at Croydon airport. Passenger fares have been reduced and the company appears to have proved that it is possible to carry passengers to Paris and return on a week-end special excursion ticket for £3 3s. For an additional £1 1s. passengers may return any other day in the week provided a day's notice is given.

The aim of the company is not only to encourage the general public to use air transport as their normal method of travel, but also to bring about the realisation that air transport is the safest, quickest and cheapest method of transporting goods, of a fragile nature or otherwise. With this object in view Air Dispatch has reduced all freight charges to a minimum, and, in addition to ordinary freight, the company now carries consignments of bullion, averaging from 750 kilos to 1,000 kilos daily from Paris for seven of the leading banks in the city.

THE LARGER CONCEPTION

A Bigger and Yet a Bigger Douglas

ON December 18 last year the first of fifteen Douglas DC-3, or D.S.T. (Douglas Sleeper Transport) monoplanes made its maiden flight and since that date testing has been going on continuously.

Its gross weight of 24,000 lb. is 5,000 lb. more than that of the DC-2: in span it measures 95ft. and is 65ft. long. It is a matter of considerable difficulty to distinguish it from its smaller predecessor but in front view the fuselage is wider in relation to its height than that of the DC-2, and the vertical tail surfaces are proportionately larger.

Measuring 7ft. 8in. in width and 6ft. 6in. in height the cabin is in eight sections, four on each side of a broad aisle. Each of these sections has two seats which face each other and are 36in. wide. For night flying the backs and bases of these fold together to form a thick, soft foundation for the mattress of the lower berth. The upper berth with its mattress drops into position from the ceiling.

The berths are 6ft. 5in. long, the lower ones being 36in. wide and the upper ones 32in. There is a space of 14in. between the occupant of the lower berth and the floor. Steps are provided for those assigned to upper berths. The lower berths are lighted by normal cabin windows which correspond to those of the DC-2 and smaller ones, higher up, serve the passengers in the upper berths. These windows, incidentally, help to distinguish the DC-3 from the DC-2. Reading lights clothes nets, call buttons and baggage racks are provided and there are separate dressing rooms for men and women passengers. These are located at the rear of the cabin and have running water.

There are greater facilities for serving meals: hot and cold food can be kept indefinitely without thermos equipment.

Mail and baggage is carried in the extreme aft portion of the fuselage and in the forward portion of the cabin.

The engines are two Wright Cyclones giving 930 h.p. for take-off and 850 h.p. at 4,300ft. At 10,000ft. the DC-3 will do 215 m.p.h. at full throttle: the normal cruising speed is 190 m.p.h. at 12,000ft. or 70 per cent. of full power. With twenty-four passengers by day the range is 1,100 miles, and with sixteen passengers and sleeping accommodation 300 miles more. The landing speed is given as 65 m.p.h. Mr. Carl Cover, vice-president and test pilot of Douglas says that it is "distinctly easier to fly than the smaller (DC-2) types.

A mock-up is nearing completion in the Douglas works of a 45-passenger monoplane. Known as the DC-4 this machine will be more than twice the size of the DC-2, and will weigh more than 50,000lb. Sleeping accommodation will be available for twenty passengers and the crew will consist of pilot, co-pilot, wireless operator, stewardess and porter. In span it will measure 135ft. and will be 95ft. long. Four engines of more than 1,000 h.p. should give a cruising speed of 180 m.p.h. and at full throttle the machine should do 200 m.p.h. according to performance estimates.

AIRPORTS on a 24-HOUR TIMETABLE

A scene at Croydon, taken by the light of one of the eight 6 kW. G.E.C. floodlights.

Modern Aerodrome Lighting Installations : Air Ministry Requirements : The Operation of Floodlights, Beacons, Boundary Lights and Obstruction Lights

By Capt. CHARLES E. WARD

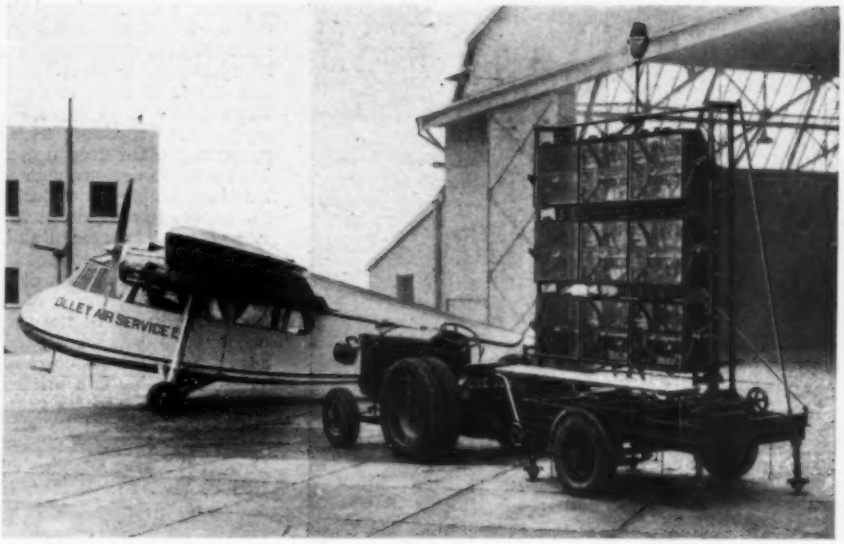
NO form of transport can afford to stop every night and wait each morning for the machinery of organisation to be set in motion again. Aerodromes and air transport alike will be one stage nearer normal business concerns, earning profits without subsidies, when a twenty-four hours' timetable has been adopted. The principal requirement for night operations at an aerodrome is lighting apparatus by the aid of which aircraft can be flown in and out with as much safety as by day.

The regulations which govern the lighting of aerodromes are surprisingly few, though this is due, no doubt, to the fact that very little night flying has taken place in Great Britain up to the present time. The lack of suitable aerodromes, and the relatively short distances between important cities in this country, have been factors retarding the development of air transport in general, and night services in particular. We have now reached the stage, however, where every town with a claim to importance has an aerodrome of some kind, and if its size is adequate there is no reason why night flying should not be carried out. The speed of air transport is rising very rapidly—cruising speeds of 200 m.p.h. will be quite common in a year's time, and, therefore, aeroplanes will be able to compete on most favourable terms with fast trains, even allowing for the delay which occurs in reaching the local aerodrome from the town itself.

Capt. C. E. Ward, the author of this article. Apart from extensive experience of practical flying, dating from the War, he is an aerodrome lighting consultant, and a member of the Aviation Lighting Committee of the B.S.I.

The position of this country as a junction between the Old World and the New means that we must cater for a tremendous volume of air traffic in the future, and not only London but every big town will need a fully equipped air harbour to handle international as well as local traffic.

The Air Ministry has laid down the conditions governing the issue and renewal of licences for sites intended to be used permanently as land aerodromes. An aerodrome may not be used regularly for night flying unless adequate lighting equipment is provided and trained personnel are there to operate the equipment. Aerodromes are divided into three classes according to size. In the first category are placed those which afford clear and unobstructed runways in every direction for 800 yards or more. In the second class are those with runways between 700 and 800 yards, and in the third those with runways between 600 and 700 yards.



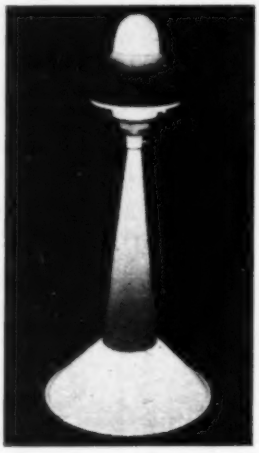
A G.E.C. floodlight, mounted as a mobile unit, in use at the Brighton, Hove and Worthing municipal airport.

It can be assumed that no aerodrome offering less than 600 yards in any important direction will be safe for regular operations at night. The schedule of lighting equipment regarded as the minimum to satisfy Air Ministry requirements for safety is as follows:—

For the smallest of the three classes of aerodromes, boundary lights, obstruction lights and landing flares. For the medium-sized aerodrome, the same equipment with the addition of an aerodrome beacon. Full equipment for aerodromes in Class A include also an illuminated wind indicator and a floodlighting system for the landing area itself.

Cost

The limits imposed on lighting installation by reason of cost are not considerable when it is remembered that the operating hours of the aerodrome are doubled by making it available at any hour of the day or night. It is not unreasonable to suggest that 10 per cent. of the capital cost of an aerodrome should be spent on night flying equipment, so that the smaller aerodromes—costing, say, £10,000—should spend a further £1,000 on lighting, and the largest—costing, say, £50,000—should have £5,000 allocated for this purpose. Commercial aircraft operators will demand as much light as possible so that pilots shall have no excuse for a bad landing with possible damage to the aircraft and its contents, due to poor definition of the aerodrome and its surrounding obstructions. The various types of lighting equipment have been evolved during the past fifteen years, which can be regarded as the experimental period of night flying, and they are now standardised in a form which will undergo no radical change for some years to come. Before giving a few details of each type, it might be as well to consider their uses.

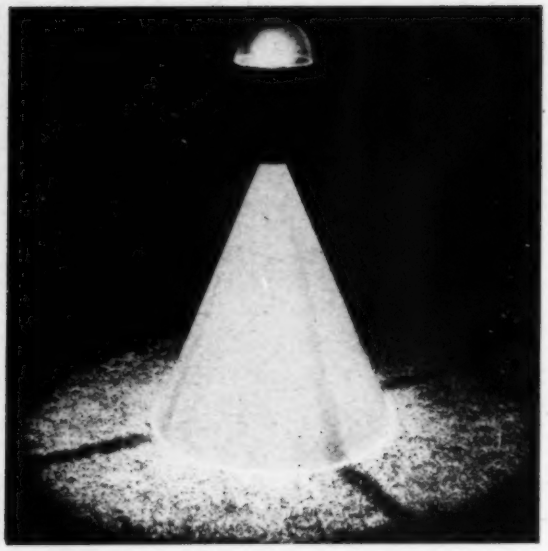


(Right) The latest type of G.E.C. boundary light. (Below) A typical installation of a Chance floodlight with Laminoid housing; this one is on the roof of the traffic office at Heston.

Types of Equipment

Boundary lights are needed to outline the exact landing area, so that the pilot can see its shape and gauge his glide in order to land as near as possible to the centre. All obstacles within the aerodrome itself which are dangerous to flying must be marked with *obstruction lights*, and obstacles outside, but within 1,000 yds. of the aerodrome and exceeding certain heights above ground level, must be similarly defined. *Landing flares* offer the simplest means for giving wind direction, at the same time telling the pilot his exact position in relation to the ground when actually making his landing. The disadvantage in their use is that they have to be laid out by hand, and, if the wind changes, then the line of the flare path has to be changed also. As everybody knows, landings must always be made into the wind, and an *illuminated indicator* supersedes a flare path on up-to-date aerodromes, so that the pilot may know exactly the direction for approach. The reason for an *aerodrome beacon* is obvious—it is a lighthouse, giving out a distinctive signal enabling pilots to locate the aerodrome from afar and to be certain that they are steering towards the right aerodrome out of several which may be in proximity. *Landing area floodlights* are intended to light up the surface of the ground, thereby relieving the pilot of any anxiety as to its contour and freedom from temporary obstructions.

An aerodrome lighting system should be all-electrical to secure efficiency and economy. Boundary lights must be orange in colour, to a specification approved by the Air Ministry, and must be mounted at a height between two and four feet above ground level. Their spacing should be as nearly as possible 300 ft. apart. It is important to note that the voltage of lamps must be low enough to avoid all risk of fire or shock in the event of an aeroplane colliding with one of the lights, and the whole structure must be such



A night-time view of the latest type of Chance boundary light, the design of which is such that the pilot has a good idea of perspective.

that it will collapse easily if hit by an aeroplane whilst taxi-ing. A single-core ring main is sufficient for a boundary light system, each unit containing a small transformer fitted to its base, to reduce the current from the main to approximately 6.6 volts for the actual lamp itself.

Obstruction lights are electric lamps mounted in duplicate and covered by a red shade. One lamp is in use at a time, provision being made through a solenoid-operated relay automatically to light the spare lamp should the first one fail. This provision is of great importance. The extinction of an obstruction light may cause a very serious disaster, and it is therefore obvious that a stand-by light with the mechanism for its automatic operation is an insurance against accident to be purchased at a very low figure.

Since flying began, night landings have been made with the aid of paraffin flares. To-day they can be regarded as emergency equipment to be kept in store in case the electric current fails or a ground mist makes an additional aid for safe landing desirable. Such flares need be no more than tins containing cotton waste soaked in paraffin, which, when lit, show a smoky red flame. They are laid out on the aerodrome in the shape of a " T " or an " L " to indicate the direction of the wind and the positions where the pilot should touch ground and finish his landing run.

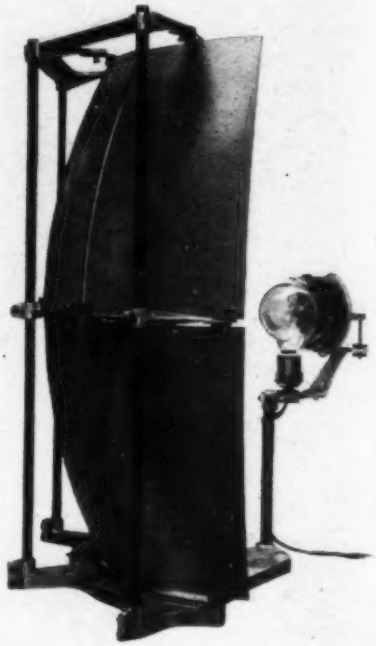
Aerodrome Beacons

Aerodrome beacons may be either an arrangement of neon tubes flashing a Morse character to indicate the aerodrome, or a revolving optical system similar either to a marine lighthouse or an elaboration of a searchlight. An aerodrome beacon should be red in colour, except in localities where there are no other lights with which the beacon might be confused. Neon lighting offers a solution to the colour problem, but it is quite easy to impart a red colour to the other forms of beacon mentioned.

An illuminated wind indicator in its most convenient form is a metal structure in the shape of a letter " T," the length of each member being 20 ft. Visibility is secured by mounting electric lamps on its upper surface. The wind keeps the indicator in the right direction by its pressure on a fin mounted below the " T " structure itself. The most satisfactory colour has been found to be white.

Landing area floodlights are possibly the most important items of equipment for ensuring safe and speedy handling of night air services. The object of a floodlighting system is to illuminate the landing area so that a pilot can come in with as much confidence as in daylight. It is of vital importance that such lighting should be designed and installed so that the illumination is even over the whole of the landing surface, casting no hard shadows. Floodlighting systems vary according to the nature of the aerodrome and the availability of electric current on the site, but in this country there is usually no difficulty about current supply, and therefore mobile floodlights with their own generating plant need not, as a rule, be considered. The most modern designs, some of which are illustrated in this Number, employ a reflector system, using any number from three to nine lamps to give a candle-power exceeding 1,000,000. The area illuminated by one floodlight is in the region of 5,000,000 sq. ft., with an extreme range down the centre of the beam of half a mile. The most economical layout is a series of three or four floodlights spaced equidistantly round the perimeter of the aerodrome, any one or two being switched on from the control tower, according to the direction of the wind.

The foregoing is a brief description of aerodrome lighting apparatus and its function. There are two publications which should be studied by those responsible for aerodrome equipment and management. Air Ministry Pamphlet No. 55, dealing with the licensing and classification of civil aerodromes, lays down certain rules about



One of the three lamp and reflector units of a Chance floodlight of the type shown on page 111.

lighting equipment. In addition, there is a British Standard Specification for land aerodrome and airway lighting. This Specification goes into considerable detail concerning the various items of equipment which have been mentioned, and it represents the considered opinion of a Committee whose members included representatives from the Air Ministry, leading manufacturers of lighting apparatus, and the aircraft operating companies. There are two British companies which have specialised in aerodrome lighting equipment. These two concerns approached the problems involved in aerodrome lighting from different angles, and the result of their many years of experimental work is a complete range of equipment for every requirement, differing in points of detail but directly comparable in performance. A few other firms have entered the business more recently, but their products are none the less practical. A review of the work of the aerodrome lighting section of the industry will be found elsewhere in this issue.

Private Flying

Topics of the Day

Clubs and Airports

IN the course of the various conferences and discussions dealing with the airport question very little is normally said about the continuously good work which has been and is being done by the clubs. Apart from the undoubted fact that the club movement has accelerated, in no small measure, the provision of the necessary aerodromes in various parts of the country, a small or large bunch of enthusiasts in each town at present provided with an airport has often been largely responsible for the business of goading the corporation into life.

Occasionally, a club has even been formed and an aerodrome has been either newly laid out or reinhabited after a long period of disuse without any kind of support—other than moral—from the local authorities. Then some person or persons have succeeded in convincing the corporation that a town without an airport will, in due course, be like a town without a railway station (or words to that effect), and the City Fathers have proceeded to take the credit for a farsightedness which had not previously been noticeable.

Justifying Expense

FURTHERMORE—and despite the sanguine hopes which sometimes uphold the uninitiated in their bleatings while temporary members of an airport committee—"giant air liners" are not likely to be seen popping in and out of a new provincial airport on the day after its ceremonial opening, and, in the meantime, it is the local club which gives the airport an air of mild busy-ness during the early days. It is the club, too, which provides the real, but rarely mentioned immediate justification for the considerable expenses involved.

Long ago, in the days before the few available flying clubs were more than debating societies, a certain club had installed itself with a half-completed glider in one of the many big hangars at a deserted Service aerodrome. This aerodrome was a big one, and it lay more or less within walking distance of the centre of an extremely large city.

The club, in a still small voice, suggested that it might be a good idea if the space were kept open and if the local building contractors were kept away. No notice, of course, was taken, and the site of this aerodrome is now a mass of already subsiding houses with a small portion of the open space left as a recreation ground. A good pilot might be able to squeeze a Gipsy Moth into it and be able to fly it out at some risk to the surrounding chimney-pots and to the weaker hearts among the local inhabitants.

The Results of Procrastination

THE city now has its own municipal airport somewhere else, and much less conveniently situated. What is more, this airport is about two-thirds of the size of the original aerodrome—though the approaches are better—and, when the wind is in certain directions, pilots have some considerable difficulty in getting fully-loaded machines into it at all.

Any club member would have been able to tell those responsible that it was too small. I had two attempts at it myself on my first arrival with a clean aeroplane. Probably I should have stayed quite comfortably within the airport boundaries on my first attempt, but it is rather frightening to see the hedge coming up with one's wheels still only vaguely in contact with the earth.

On another occasion I was sitting as a pseudo-radio operator in a big machine while approaching this airport. The pilot throttled back well away from the boundary, reduced his speed to one that was somewhat lower than any constructor's test pilot would have recommended in his more sanguine moments, and used just enough outboard engine to keep the machine flying until the wheels were over the boundary. Then he hauled everything back and landed. Even so, he had to use his brakes quite hard, and I felt glad that there was a voice-proof bulkhead between him and his more innocent passengers.

Forced Landings Again

THIS business of rumbling commercial machines into small aerodromes reminds me of Flt. Lt. Johnson's most interesting statements in reply to previous remarks on this page, which appeared in the Correspondence columns of *Flight* of January 16.

In the light of my trivial experience of such things I should say, even forgetting the definite forced landing statistics which he gave, that he is absolutely right as far as the approach is concerned, though it is undoubtedly necessary to fly up and down a chosen field before making the rigidly correct approach. Once, when landing at another very small aerodrome with a clean aeroplane, I decided that this was the moment at which to forget all I'd learnt and to do some rumbling. I came in low with a little engine, but overshot badly enough to make another attempt advisable. My second approach was carried out according to rules with periodical peeps at the A.S.I., and my final short sideslip brought me in just over the low hedge with only enough speed for a properly controlled hold-off.

The motoring approach is probably perfectly safe with big machines because the pilot usually has a perfect forward view and because the machine is, in any case, being flown very largely on the tail-trimming wheel. I imagine that it is difficult to stall an air liner with the normal control if the machine has been correctly trimmed for an 80 m.p.h. glide—provided, of course, that the engines which are used do not affect this trim. Hence, presumably, the use of the outboard engines only on four-engined machines when a rumbling approach is being made.

INDICATOR.

Private Flying

FROM the CLUBS

Events and Activity at the Clubs and Schools

HANWORTH

NEW members include Mr. A. Callier (Belgium), who is taking an "A" licence course, and Mr. Canias (Spain), who is taking a blind-flying course. Last week's flying time (there were four non-flying days) was 15 hr. 10 min.

LONDON

Mr. D. A. Letts completed his night-flying tests last week, during which the flying time was 46 hr.

READING

The film dance, which was to have been held on Saturday, February 8, has been postponed until February 29 owing to the death of the King.

TOLLERTON

Mr. G. W. Marshall has gone solo. Flying times for the week ended January 23 totalled 14½ hr. A number of charter flights were made, and Mr. W. H. Fane flew to Bristol.

SHOREHAM

Club machines flew 19 hr. last week and Mrs. Tiltman and Mr. Wright joined the Club. The annual dinner and dance which was to have taken place at Warnes Hotel, Worthing, on February 7 has been postponed owing to the King's death.

CASTLE BROMWICH

The flying times for the fortnight ended January 23 amounted to 19 hr. 10 min. dual and 5 hr. 15 min. solo. Messrs. H. G. Everitt and A. White (flying) and Mr. E. R. Thomas (ordinary) have become members. Mr. G. E. P. Thorneycroft has gone solo.

PORTSMOUTH

Mr. T. Boughey has gone solo and Mr. J. W. Lane has passed his "A" licence tests. The following new members have joined the Club: Messrs. L. J. Sykes, P. G. S. Errington, C. Rochford-Body, and F/O. R. J. W. Barnett. The total flying time was 16 hr. 30 min.

MADRAS

November last year saw the Club slowly coming to life again after its recent disasters. The turn of the tide actually dates from November 3 when a new Gipsy 11 metal Moth was received into the Club's fleet. Seventy-seven hours ten minutes flying was recorded during November.

During December Mr. V. Sundaram took his "A" licence, and P. W. Lomax went solo. Flying times totalled 138 hr. 40 min. During the month Wing Cdr. D. S. R. Crosbie arrived with the first Hornet Moth to be seen in India.

C.A.S.C.

On Sunday twelve members attended and flew 5 hr. 15 min. dual and 3 hr. 5 min. solo. The dance of No. 1 (London) Squadron which was to have been held on January 22 has been cancelled owing to the death of the King, until February 13 at 8 p.m.

CAMBRIDGE

Thirty-two hours were flown during the week ended January 25. A special navigation instruction flight was made in the Monospar. Mr. Pears, who joined the School only a few days ago, made his first solo last Sunday. Another solo was made by Mr. Sales.

REDHILL

During the week ended January 27, Club machines flew 67 hr. 45 min. Mr. D. T. Low passed his "A" licence tests, and Mr. W. R. L. Beaumont made his "B" licence night flight.

Flying time for the week ended Friday, January 24, was 58 hr. 20 min. Mr. B. C. Frost completed his "B" licence night flight and five new members joined the Club.

COVENTRY

The fifth and sixth members of the Coventry Aviation Group to be passed for their "A" licences are Messrs. J. A. Merrifield and L. D. Anscombe. Last week Messrs. R. W. Edwards and F. E. Robinson went solo.

His Worship the Mayor of Coventry, Alderman C. Payne, J.P., has presented a silver cup to the Group to be awarded annually to a member for work done toward the promotion of civil aviation in Coventry. At the committee's unanimous recommendation the award for 1935 was made to the Hon. Secretary.

The Group has reduced its rates for solo flying to 30s. per hour. A supper dance will be held at the Chase Hotel on January 31.

CINQUE PORTS

Mr. Eric Davis and his wife have gone to Madeira for four or five weeks. The Club has bought a Tiger Moth for training "B" licence pilots. It is also available to any member for instruction in advanced aerobatics and for "checked up" soloists.

Henceforth, a landing competition will be held each month and a small cup will be given to the winner. A flying committeee will be formed to deal with this and kindred matters. Mr. Joe Parslow has offered to give a handsome bowl for a competition and it is likely that this will take the form of a cross-country flight with, perhaps, two or three forced landings.

Mr. Gleichman, of the American Lubricating Oil Co., and Mr. Van Nevenhoff, flying an Areonca, landed last Friday owing to trouble with the petrol gauge. This was put right and the following morning they left for Holland.

AN AERODROME IN A WIND TUNNEL: Some time ago details were given in *Flight* of the wind-tunnel experiments which have been carried out on a model of Rongotai aerodrome, the headquarters of the Wellington Aero Club, New Zealand. As a result of the tests on the model, which is shown here, Moa Point (in the centre) is having its top removed and the spoil is being thrown into the valley on the right. The aerodrome, of course, is the lighter patch behind the Point, which has caused some very difficult eddies in the past.

A Praga Agency

THE Airwork sales department has obtained the London district agency for the Hillson Praga. Recent demonstrations of this machine at Heston created a very favourable impression.

A "Pou" by Night

MR. CLAUDE OSCROFT, the instructor of the Aero-8 Club, recently carried out what is believed to be the first night flight in a *Pou*. He left the ground at 8.55 p.m., January 11, and circled the aerodrome twice at 1,000 ft., making a landing at 9.15 p.m. in the flare path provided. The Club machine is now equipped for night flying.

Holland and the Carden "Pou"

MR. J. BACH, an experienced pilot and editor of the Dutch national aviation journal, has made a successful flight on Mr. S. V. Appleby's Carden-engined *Pou*. He is the third pilot without previous *Pou* experience to fly the Carden-Appleby machine. He expressed his satisfaction at the performance—which appeared to be unaffected by his 190 lb. weight—and he handled it very well.

He is negotiating with Abbott-Baynes Aircraft on behalf of friends in Holland for the Dutch agency for the Carden-engined *Pou*. Abbott-Baynes Aircraft Ltd., and Carden Aero Engines have agreed to work together as regards foreign sales of this aircraft and engine.

Another Increase

ALTHOUGH 1935 returns have been received from only twenty-seven of the thirty-three subsidised clubs at present in action, an aggregate membership of 7,738 is shown, as compared with 7,490 for all the clubs during the previous year, and 4,800 in 1933. Active flying members total 4,271 of this figure, as against the 4,175 at the end of 1934.

Still greater increases are shown in the number of flying hours and of licences gained. The twenty-seven clubs flew 39,098 hours—or 3,863 more than all the clubs during 1934. 559 "A" licences, against 506 in the previous year, and 123 "B" licences were obtained. The "B" figure is a good deal more than twice that of 1934.

Important to "Pou" Builders

THE Air League has just discovered a minor error in the text of *The Flying Flea*. On page 128, Fig. 26, the dimension from the back of the seat to the cross bar 85 should be 400 and not 350. This is an important dimension. The *exact* position of the cross bar 75 should be determined by lining it up with the cross bars 74 and 85 after the latter has been fixed in the correct position.

Fuselages which are already finished must be opened up and modified to provide a bulkhead with cross bar 85 in the correct position.

Various points must be observed in preparing *Poux* for test by the Air League, who have just issued a list for the benefit of those who are taking advantage of the testing scheme.

Aerodromes for All

A LARGE number of good reasons can always be suggested to explain the comparative dearth of private owners in this country. Not the least important of these is the fact that aerodromes are not always easy to reach, and are, in any case, somewhat scarce in this country. An owner whose machine is housed at any aerodrome twenty or more miles away is hardly in a position to make the best use of his machine.

The idea of a communal aerodrome or air estate may appear to be a little before its time, but, in this case, the supply should automatically cause the demand. Air Estates, Ltd., of Manfield House, 376, Strand, W.C.2, believe that the number of private owners will naturally increase if better facilities are provided for them.

Briefly, this company propose at first to assist private owners to acquire suitable aerodrome sites, with or without houses, and to this end agents have been appointed in various parts of the country. A very small charge, waived in the case of flying club members, is made before enquiries are carried out. Starting with this work, the company hopes eventually that it will be practical to lay out estates which include a communal aeredrome.

In the meantime, any property owner who has suitable land for sale is invited to send full details to the company.

The Gliding Subsidy

AT the annual general meeting of the Aircraft Club, Harrogate, the opinion was unanimously expressed that it was most unjust that many of the pioneer gliding clubs, including the two oldest gliding clubs in the country, namely, the Aircraft Club and the Kent Gliding Club, were unable to benefit in any way from the gliding subsidy, and the Aircraft Club requested that the distribution of the subsidy should be suspended until the matter had been officially inquired into.

The Aircraft Club, incidentally, has joined the Federation of British Gliding Clubs.

More and More

TWO hundred people, it is learnt, have already joined a Glasgow *Pou* Club. Negotiations for an aerodrome within easy reach of the city are proceeding, and, at present, it is planned to have five machines—two *Poux* and three B.A.C. Drones. These will be hired at 7s. 6d. an hour.

Meanwhile, two Northern enthusiasts have discovered rather a good way of "getting the bugs" out of the *Pou* before too much work is done. Each is building his own, but, whereas one is starting with the wings, the other is starting on the fuselage, so that they can then share their combined experiences before proceeding. In the words of a friend, "The result, therefore, will be two machines; A with doubtful wings and a first-class fuselage, and B with first-class wings and a doubtful construction in which to sit."

Butterfields, of Shipley, the tank manufacturers, now have a staff *Pou* club, and a firm near Hooton is to be formed for the purpose of building these machines. The people concerned are R. C. Caunce, of the Two Mills Engineering Co., Ledsham, Wirral, Cheshire, and H. Dodgson, of Willaston, Wirral. They have built an experimental machine which appears to have a Scott engine.

The F.B.G.C. Meeting

THE first annual general meeting of the Federation of British Gliding Clubs was held in London on Saturday, January 18, and was attended by representatives from clubs all over the country.

Following a report of the reasons for the formation of the Federation last May, the vice-chairman (who was presiding in the absence of the chairman) gave a detailed account of its activities to date and its plans for the future. He stressed the point that the Federation was not in opposition to any other similar existing organisation, but was formed so that those clubs which, under the new rules of the British Gliding Association, were unable to affiliate with that Association might have a representative body on which their opinions could be voiced. He pointed out that the sub-committee appointed by the B.G.A. to deal with the administration of the subsidy was composed of five members of the two largest clubs in the country and only one representative from the other clubs. The conditions laid down by this committee for qualification for the grant were reasonable in themselves but were far too rigid and "exclusive." The clause requiring five years' security of tenure of a soaring site was particularly hard on some clubs, and that requiring clubs to raise supplementary capital to the extent of 50 per cent. (in the case of machines) of the amount of the grant claimed was even more difficult.

Last September the Federation Council decided that strong action was necessary if the provincial clubs were to see any of the subsidy, and plans were made whereby approved soaring sites could be shared by Federation clubs—those unable to secure a five years' lease sharing sites with their more fortunate neighbours. The offer of one such site had already been accepted, and more were likely to be forthcoming. But the most important way by which the Federation was able to help clubs affiliated to it was by enabling them to register as limited liability companies for about £5 less than any other method that had yet been offered them. This scheme was already under way, and several clubs were about to register through the Federation.

The vice-chairman then pointed out that originally clubs requiring Government aid towards hangars and buildings were forced to have these erected and to have certificates of approval signed by architects and surveyors before grant towards them was guaranteed. These conditions spelt bankruptcy for most clubs, but, through the efforts of one of the Federation clubs, they had been considerably modified.

Plans for the immediate future were fully discussed but, owing to pressure of time, the details were left to the next meeting.

HERE and THERE

G.A.P.A.N.'s Message to the King : Death of Mr. John Lord : An Encyclopædia of Aviation

G.A.P.A.N. Message to the King

THE following message has been sent to His Majesty the King by the Guild of Air Pilots and Air Navigators. It is signed by Capt. Lawrence A. Wingfield, M.C., D.F.C., Clerk to the Guild.

"May it please your Majesty to accept the profound sympathy of the Master, Wardens, Court and Members of the Guild of Air Pilots and Air Navigators of the British Empire in the loss which has befallen your Majesty and the Empire by the death of his late Majesty King George V, your beloved and revered father.

"They also wish to express their very deep loyalty and devotion to your Majesty's person."

Death of Mr. John Lord

FLIGHT deeply regrets to record the death of Mr. John Lord on Sunday, January 26. There was no more popular man in the whole aircraft industry than John Lord, and no more genial personality. With his never-failing store of jokes and good stories, he was the life and soul of every gathering of aeronautical men. Yet his jovial exterior covered a very astute business sense, and the bargainer who hoped to get the better of him needed to get up very early in the morning. Withal, John Lord had a kind and generous heart. No good cause ever asked for his help in vain, and it is believed that many a private person has had cause to thank a generosity which let not the left hand know what the right hand did.

The late Mr. John Lord.

Aeronautical progress owes more to the initiative of John Lord than is perhaps generally recognised. When "A. V." (Sir Alliott Verdon-Roe) had spent his last savings in building experimental aeroplanes, he came to one of his brothers who was then in partnership with John Lord near Manchester. "A. V.'s" designs showed promise, and these two decided to help him and back him. They formed the company of A. V. Roe and Co., Ltd., and Avro aeroplanes soon became world-famous. John Lord was always a most loyal admirer of "A. V.," and would give all the credit of the success to him. Together they left the firm which they had founded and joined in founding Saunders-Roe, Ltd., of which, and of Spartan Aircraft, Ltd., John Lord was managing director at the time of his death.

Improved Outlook

A DEMONSTRATION was given last week, by Dr. H. Barron, of a compound which he has evolved in order to prevent the misting of glass and the formation of hoar frost on windscreens. It should interest the aeronautical industry, because it may prevent moisture deposition on the windows of cabin aeroplanes.

Dr. Barron is at present conducting experiments with a view to producing some derivative which can be applied to the wings of aeroplanes to prevent icing up. The compound is said to be completely effective on celluloid, Rhodoid, etc., and is most efficient in powder form.

"Enquire Within"

"Encyclopædia of Aviation." Compiled and Edited by Sqn. Ldr. C. G. Burge, O.B.E., A.R.Ae.S., A.Inst.T. Sir Isaac Pitman and Sons, Ltd., 15s.

THE major problem facing he who sets out to compile an encyclopædia is not "how much to put in" or "how much to leave out," but rather "where to leave off." He finds himself in this quandary whether the space at his disposal be great or small, and the manner in which he extricates himself is the true measure of his expertness at the task.

This is as true of an encyclopædia of aviation as of one dealing with any other subject. Sqn. Ldr. C. G. Burge, the editor of this volume, appears to have made the very best use of the space at his disposal—641 pages—having "left off" at reasonable but wide boundaries. Suffice it to say that there is scarcely a single aspect of aviation on which it is impossible to obtain really helpful information. Quoting at random, the encyclopædia will tell you what a synoptic weather chart is; inform you of the conditions of service for airmen in the R.A.F.; instruct you in first-aid for the injured; expound bird flight and its relation to aeronautics; and define sovereignty over air space: even should your thirst for knowledge lead you to enquire as to the nature of a haar, a haboob, or a southerly burster, Sqn. Ldr. Burge can slake it.

The work is extraordinarily well illustrated with photographs and drawings, a number of them from *Flight*. No one whose interest lies in aviation, be he an air-minded schoolboy or the managing director of an aircraft factory, could fail to profit from the ownership of this very excellent book.

The Lowe-Wylde Fund

THE latest list of donations to the Lowe-Wylde Memorial Fund brings the total up to approximately £660:—

	£	s.	d.
H.H. Prince Ghanstryamish of Limbdi	5	5	0
J. E. D. Holder	5	0	0
H. R. B. Howell	2	2	0
Oliver Lucas	2	2	0
Jack Barclay	1	1	0
C. W. Breadmore	1	1	0
Delco-Remy and Hyatt, Ltd.	1	1	0
Erik Hoerman	1	1	0
H. A. Holmes	1	1	0
C. J. Joyce	1	1	0
Major R. Maude	1	1	0
R. D. F. Paul	1	1	0
H. Pavillet	1	1	0
D. Rosenfield	1	1	0
J. Russell Rose	1	1	0
Miss A. B. M. Cumberbatch	1	0	0
Maurice Turner	1	0	0
S. J. Hine		10	6
E. Magee		10	6
Mrs. Helen Crosland		10	0

Donations should be sent to Mr. E. C. Gordon England at the London Air Park, Feltham, Middlesex.

Forthcoming Events

Jan. 30 and 31. Aerodrome Owners' Association: Annual Conference and Aerodrome Equipment Exhibition, British Industries House, Marble Arch, London.

Feb. 3. R.Ae.S. Lecture: "Airscrew Development" by Dr. H. C. Watts. Institution of Electrical Engineers, 6.30 p.m.

Feb. 12 Yorkshire Aviation Services Country Club: Dinner and Dance 8 p.m., Grand Hotel, Harrogate.

Feb. 13. Civil Aviation Service Corps, No. 1 (London) Sqn. Dance, 8 p.m.

Feb. 13. R.Ae.S. Students' Section Lecture: "Light Aeroplane Design and Construction," by Dr. N. A. de Bruyne. 7 p.m., R.Ae.S. Library 7, Albemarle Street, London W.1.

Feb. 17. R.Ae.S. Lecture: "The Boundary Layer," by Prof. L. Bairstow. Institution of Electrical Engineers, 6.30 p.m.

Feb. 20. R.Ae.S. (Coventry Section) Lecture: "Variable-pitch Airscrews," by Mr. T. E. Beacham, 8 p.m. Armstrong Siddeley Canteen.

Feb. 21. Croydon Airport Staff Dinner and Ball, Greyhound Theatre, Croydon, 7.45 p.m.

Feb. 21. D. H. Aeronautical Technical School: Annual Dance, Hyde Park Hotel, London, 9 p.m.

Feb. 25. R.Ae.S. Students' Section Lecture: "Mechanical Testing of Structures and Components," by W. Tye. 7 p.m., R.Ae.S. Library, 7 Albemarle Street, London, W.1.

Feb. 28. Bristol and Wessex Aeroplane Club: Annual Ball.

THE SELECTION of an AIRPORT SITE

How Air Ministry Requirements and Other Practical Considerations Affect Choice : The Problem of Reaching the Best Compromise

By AIR-COMMODORE J. A. CHAMIER, C.B., C.M.G., D.S.O., O.B.E.

AN expert witness was recently giving evidence before a Select Committee of the House of Lords in favour of a downland aerodrome near the sea. Counsel for the opposition rose to cross-examine:

"Do you agree that the Air Ministry is the highest authority on this subject?"

The witness politely agreed.

Counsel waved an official booklet triumphantly: "I read here that the Air Ministry does not recommend an aerodrome on an elevated site, since low clouds may obscure it."

"Read on!" said the witness.

Counsel demurred, but their Lordships were interested: what had the witness in his mind? Whereupon the latter explained that later paragraphs laid down that the aerodrome *must not be on low ground for fear of mist, nor near the sea because of sea fog, nor near a town because of smoke, nor away from a town because it would be useless!*

The story is told because it illustrates so clearly the conflicting considerations which affect the selection of aerodromes; knowledge of the requirements is but the first step to selection.

Air-Comdre. J. A. Chamier, the author of this article. Though best known, perhaps, as Secretary-General of the Air League, Air-Commodore Chamier is an aeronautical consultant of great experience, as regards both aircraft and aerodromes. He is a member of the Aerodrome Owners' Association, in which he acts as nominee of the Belfast Harbour Commissioners.

What are these requirements? They may be summarised as follows:—

Access: By far the most important attribute of a good transport aerodrome is ease of access; this must be measured by time rather than distance.

A single example will show the enormous influence of speedy access: An air service connects two towns 150 miles apart; the aircraft cruise at 150 miles an hour "made good"; the terminal delay in the journey between the city and the aerodrome with the time for embarkation or disembarkation amounts to 30 minutes at each end. *The speed "town-to-town" averages 75 m.p.h., i.e., not much faster than our best trains.*

To raise the town-to-town speed to 100 m.p.h. average we must make the aeroplane fly at 300 m.p.h.: alternatively, we may cut 15 minutes off each terminal delay.

On long-distance Empire routes the matter may not be of major importance; to the internal air routes of a small country the access to the aerodromes may make the difference between success and failure.

Far too little stress has been laid on this point in the past. Technical officials do not have to operate air lines — their responsibility is the safety of the aerodromes which they license. An aerodrome in fairly open country at a distance from a town may rouse their enthusiasm; a site within view of factory chimneys they look at with dubious eyes. The former (which will never pay) will get a blessing and a licence; the latter (which might pay) may never get a chance. The operator raves and asks for subsidies if he can't have facilities. The fault is that of a system, not of any individual official or group of officials.

Examination of "Bradshaw" shows that sixteen of the aerodromes serving our most important towns are thirty minutes *or more* from the towns they serve in Great Britain and Northern Ireland.

Situation: Closely allied to the question of access is that of situation. The aerodrome should not be to leeward, in terms of the prevailing wind, of a manufacturing quarter, since city smoke may create conditions of extremely poor visibility, most unfavourable to the operations of air transport.

Coupled with this consideration we should like our aerodrome sited so that for the prevailing wind the main traffic shall not have to fly low over the town after taking off or before landing.

Ground liable to be covered by low clouds or to frequent mist or fog should be avoided.

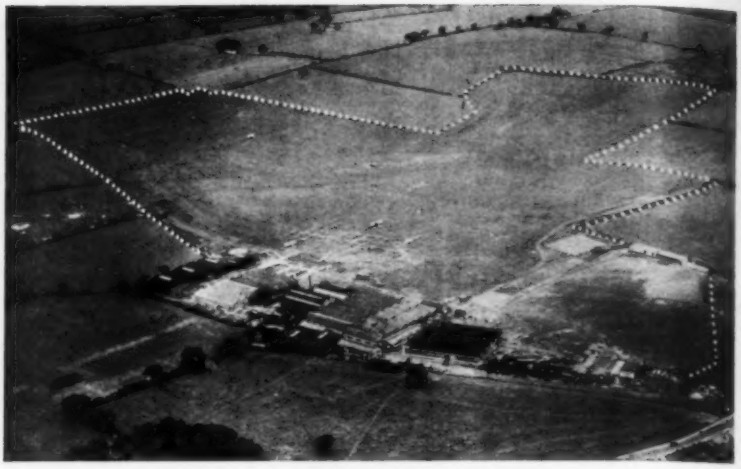
> *"THE ideal aerodrome should be within a few miles of a city in the middle of a vast, grassy plain, well above flood levels but not on a high plateau. It should be connected with the city by a high-speed tube, and by wide, modern roads; serviced by underground electric trains, and by Post Office telegraph and telephone cables. In some Utopia such sites might be found; in this present world, never."*

Area: For a Class A aerodrome licence the requirement is that effective runs of 800 yds. in any direction shall be available. In theory this would be provided by a circle of 800 yds. diameter, with an area of 103.9 acres, but this area would conform with the requirements only if the boundaries were of nil height. Any obstacles on or near the perimeter, such as a line of trees, an embankment, etc., are considered as influencing the actual run by ten times their height, due allowance being made for distance beyond the perimeter. Thus, for a line of trees 50 ft. high along one boundary, 500 ft. would have to be deducted from the run afforded, and the "effective" run would be 800 yds. minus 500 ft. = 635 yds. The same trees

500 ft. away from the perimeter would not affect the run afforded.

But nature does not build in circles, and more often the aerodrome is some irregular polygon or other queer figure. Too strange a shape is undesirable: the pilot landing in conditions of poor visibility must have confidence that he will get into little trouble if he comes in at a right angle to any part of the boundary. Where one dimension is longer than others it is desirable that the longest run should be in the direction of the prevailing wind.

Although 800 yds. effective run is sufficient for a Class A licence, 1,000 yds. runs should be afforded as a minimum by any aerodrome with pretensions to being first class. For fog landings and take-offs an effective run of 1,500 yds. with open approaches should, if possible, be provided.



"Nature does not build in circles, and more often the aerodrome is some irregular polygon or other queer figure."

Surface: The nature of the ground affects the choice of aerodromes. Low-lying ground may be boggy and swampy and may involve the proprietors in excessive expenditure for drainage. A tendency to flood is disastrous. Abroad, certain kinds of soil (e.g., black cotton soil) becomes almost unusable after heavy rain; in this country we are luckier and our grass gives us normally the best and cheapest surface.

The ground should be well consolidated and must be smooth enough to permit an average touring car to run over it at 20 m.p.h. without discomfort, and able to bear a load of at least 2½ tons a square foot. All culverts, bridges, etc., must stand an impact load of 5 tons to the square foot.

A slight slope to enable water to run off quickly is desirable, but the overall gradient must not exceed 1 in 50 nor local gradients 1 in 40. In the absence of slope, allowance must be made for French drains to carry away the water.

Ridge and furrow can be dealt with, but the cost is considerable, since removal of turf, moving of soil and returfing or resowing must be done.

Clear Runs

Runways: Although the Air Ministry's specification lays down that runs " in any direction " should be afforded, where natural difficulties exist the authorities will normally be satisfied if clear runs of adequate length are obtained with a divergence of not more than 45 degrees between runs, so that only on rare occasions will an aeroplane have to land or take off at more than 20 degrees out of wind.

In exceptional circumstances recourse must be had to artificial runways at angles of 45 degrees.

Where a source of supply is near the site cinders are much cheaper than concrete or macadam, but will be many times the cost of grass. The Air Ministry requirement for width is 200 yards, but this is prohibitive, and where the artificial surface is clearly differentiated from the main surface a concession can normally be obtained on this point.

Obstacles: Apart from the height of the aerodrome boundaries, to which reference has already been made, certain objects are classified as obstructions. These isolated obstructions are objects on or near the perimeter which subtend an angle of more than 1°30′ (say 1 in 35) from the start of the run, and those within half a mile from the perimeter which subtend an angle greater than 5°30′ (1 in 10) from the nearest point on the perimeter.

Obstructions are found near the great majority of aerodromes. They do not prevent a licence being obtained, but on their number and their nature a decision will be made. For example, a solid and conspicuous building may be a technical obstruction but may constitute little danger compared with a lattice-work mast of the same height.

H.T. cables are not considered desirable ornaments for an aerodrome, even if they are beyond the regulation half-mile zone or below the " obstruction " height. Attention must be given to any such cables within a mile of the site. Sometimes they will be masked by buildings or by trees, or agreement may be reached for their diversion.

Night Requirements: As far as possible, every prominent object within 1,000 yards of the perimeter and over 75 feet high should be lit with obstruction lights by night; similarly, all those within 500 yards and subtending a vertical angle of more than 2°50′ must be illuminated where possible. Since lighting is expensive and sometimes difficult these considerations will influence the choice of site.

Other Considerations: Meteorological conditions must be studied. A wind chart should be prepared showing the prevailing winds and their strengths.

Fog records must be given attention; sites comparatively close to one another may differ widely in this respect.

Road approaches, whether the main service is by rail or not, should be good and preferably with alternative roads for arrival and departure where big crowds are expected.

Electric light and power, with telephone and telegraph services are required, and water supply and sewage disposal must be arranged.

It will add to the amenities of a site if the airport buildings can be sited to face N.E., so that spectators do not face the afternoon sun. On the other hand, buildings may have to be sited to mask some existing obstruction and with reference to the cost of construction of local road approaches. Aerodromes are not popular near high-class residential districts, and, since they will in time become industrialised themselves, they may conveniently adjoin an industrial area. If choice is possible, an area devoted to light rather than heavy industry should be chosen, since there will be fewer obstacles in the shape of high chimneys, etc., and less likelihood of the smoke nuisance arising.

It will be seen from the above that the ideal aerodrome should be within a few miles of a city in the middle of a vast, grassy plain, well above flood levels but not on a high plateau. It should be connected with the city by a high-speed tube, and by wide modern roads, serviced by underground electric trains, and by Post Office telegraph and telephone cables. In some Utopia such sites might be found; in this present world, never.

Specifications may approach the ideal, but there are limits to the accommodation which nature offers and to the modification which may be made to what she presents.

Knowledge and experience alone can give the consultant the ability to weigh up all the conflicting considerations and arrive at a wise judgment. On him may depend the prosperity of air traffic, and with it the growth of the city.

Flight photograph.

MODERNITY for the R.A.F.

A Low-wing Cantilever Monoplane Goes Into Service—the Avro Anson, Equipped for Long-range Over-water Reconnaissance : High Performance and a Comfortable Cabin

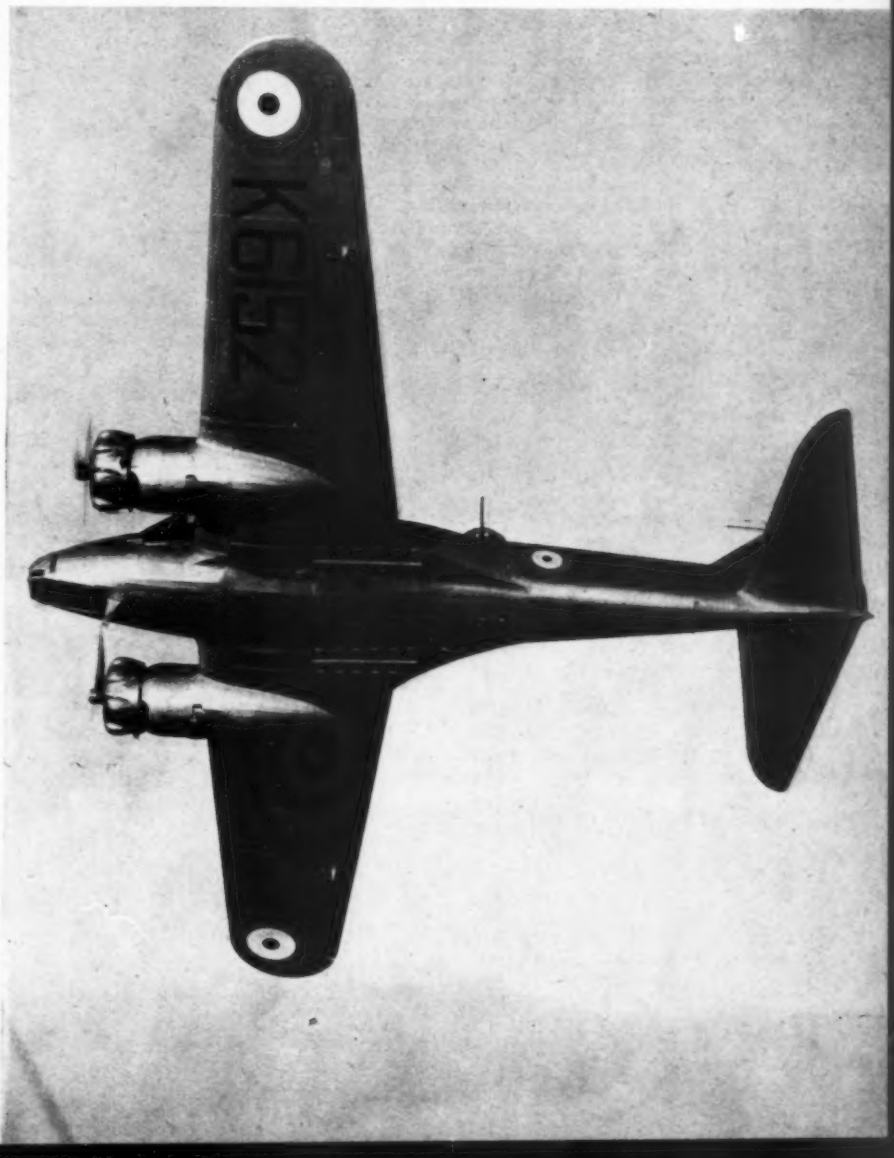
WITHIN a few weeks the first machines of a very large batch of Avro Anson general reconnaissance monoplanes will be leaving the Avro works for duty with Royal Air Force units. They will be the first machines of their class to be issued, for the general reconnaissance squadron is something entirely new to this country. Such units, based near the coast, will, in time of war, fly out to sea and report the position of any enemy ships which might venture into these waters. The G.R. machine can, if required, carry a light bomb load, and possessing, as it does, two machine guns and a high performance would not be "cold meat" to any enemy pilot.

The Anson, although designated in its Service guise a general reconnaissance aircraft, is essentially a highly efficient general-purpose type, and the uses to which it could be put by an air force are manifold. Obviously, with its twin engines, good load-carrying ability and long range, it is admirably suited to foreign service, and could fulfil its many and varied duties with economy, and, by virtue of its simple, robust, and well-tried structure, within the minimum of upkeep.

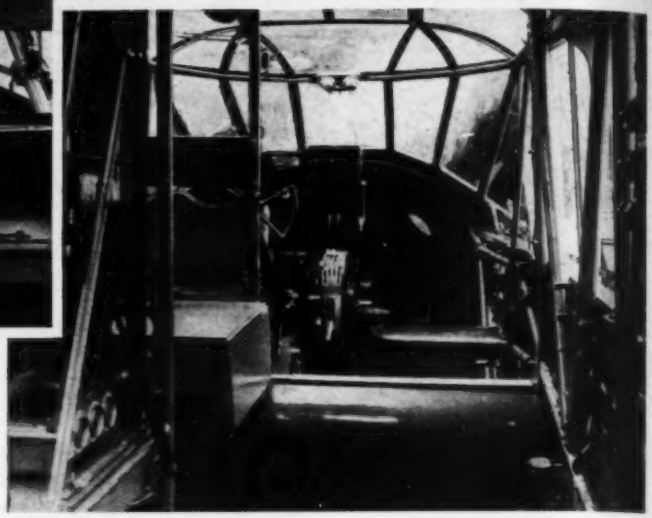
The Anson is essentially a development of the Avro 652 commercial monoplane described in *Flight* of March 7 last year. Testimony is borne to the structural similarity of the two machines by the fact that the Anson bears the Avro works number 652A. In external appearance, however, there are numerous features of dissimilarity.

It may be advantageous to recall that the one-piece cantilever wing embodies two main box spars with flanges of laminated spruce and plywood webs, joined by closely spaced ribs of spruce and plywood. The fuselage is a framework of welded steel tubes with fairings of wood and fabric covering, excepting the nose portion, which is panelled with Elektron.

The Anson is the first machine with a retractable undercarriage to be adopted for the R.A.F. Each of the two separate portions of the undercarriage is mounted under



In this fine *Flight* photograph of the first production type Avro Anson there can be seen, among other features, the disposition of front and rear guns, the bomb traps, wing-root filleting and the interesting shape of the tailplane.



The view above shows the rear portion of the roomy cabin (without its complete equipment) and the door leading into the A.W. gun turret. In the right-hand view may be seen the forward portion of the cabin. (*Flight* photographs.)

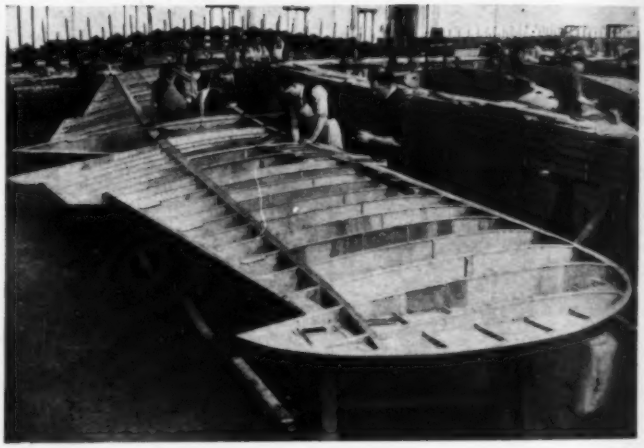
each engine nacelle, and is normally retracted by mechanical means; there is a crank handle for alternative operation. Dunlop wheels, tyres and pneumatic brakes and Turner legs are fitted as standard. When the wheels are in the "up" position a small portion of each tyre protrudes below the nacelles. The swivelling tail wheel is not retractable.

Mass balances are used on the rudder and elevator, and the ailerons are of the Frise variety. The tail plane is fixed, but the elevator, like the rudder, has a small trimming "tab" actuated by a handwheel in the cockpit.

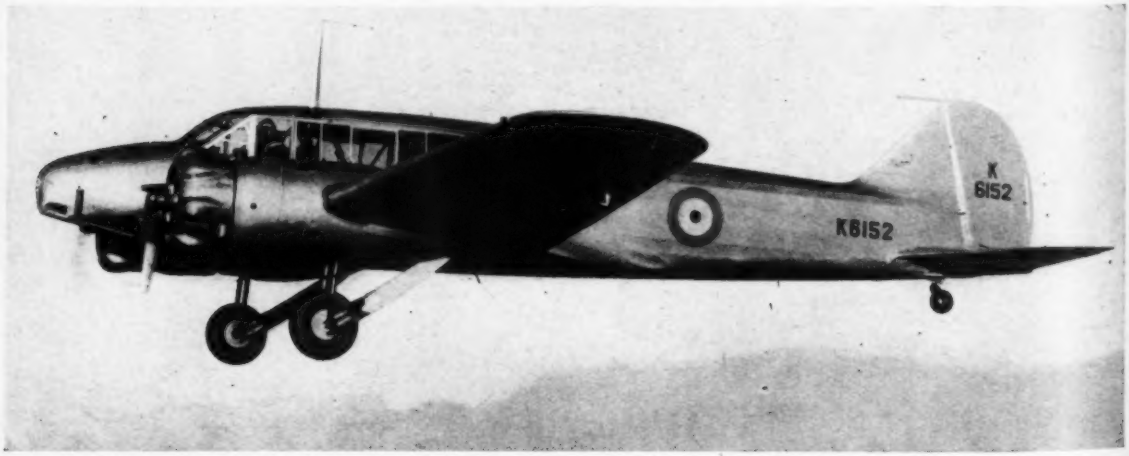
Siddeley Cheetah IX seven-cylinder radials are fitted to the Ansons under construction for the R.A.F. The Cheetah IX is rated at 310 h.p. at 6,000 ft., and is designed for operation on the new Service fuel of 87 octane number. Each of the Anson's Cheetahs is provided with its own fuel and oil tanks, these being of welded aluminium and mounted in cradles in the wing. Duplicated fuel pumps mounted on the engines themselves feed the fuel to the carburetters. The engine mountings are welded tubular steel frames.

An interesting form of cowling is being used. It is fairly long in chord and small in diameter, the actual cylinder heads and valve gear being housed in scallops or helmets standing out from the main body of the cowling. This arrangement permits a nacelle of comparatively small diameter to be used, and improves, in consequence, the lateral vision, which is of great importance in a reconnaissance machine. The airscrews are two-bladed metal Faireys.

At the moment the Anson is not fitted with flaps, but an experimental Dowty-operated set is being prepared, and due weight allowance has been made in the production Ansons for their fitting. Apart from increasing the gliding angle they should reduce the landing speed of 66 m.p.h. by 9 m.p.h., thus facilitating small-aerodrome operation.



Some idea of the size and the nature of the construction of the wing may be gathered from this view. (*Flight* photograph.)



Mr. S. A. Thorn lowers the undercarriage of the first production type Anson for the benefit of *Flight's* photographer.

For general reconnaissance duties a crew of three is carried, consisting of a pilot (who operates the fixed gun), the navigator (who performs the duties of bomb aimer), and a wireless operator, who is alternatively the rear gunner.

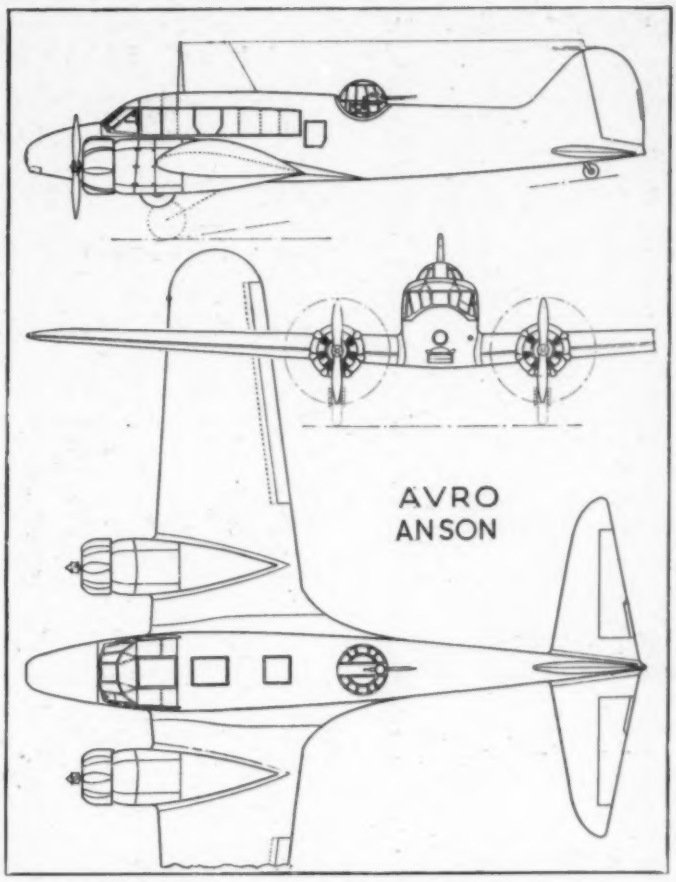
In the extreme nose of the fuselage is the prone bombing position, with the bomb sight and appropriate instruments, a drift sight, and a Harley landing light. The pilot's cockpit is immediately aft of this and is provided, in the production model, with Cellastoid panels in the roof in place of the original metal covering. Parallel-motion rudder pedals are fitted on the port side, where the pilot sits, and the ailerons and elevator are operated through a normal stick and wheel control. The main instrument panel bears all the usual dials, the instruments for blind flying being attached to a shockproof mounting. Indirect instrument lighting is provided for night flying.

Pilot's Equipment

The pilot has a single Vickers 0.303in. machine gun, the breech of which is easily accessible to his left hand; the barrel protrudes into a channel in the nose fairing. Four hundred rounds of ammunition can be accommodated in the belt box, and the sights are of the ring and bead type, the ring being mounted in an inverted position actually inside the cockpit. A set of bomb release controls is also provided for the pilot's use. Other items suitably placed near the pilot are warning signals showing the position of the retractable undercarriage, petrol controls and handles for the operation of the trimming tabs. Just behind the pilot's seat are racks for two parachute packs, which are clipped in an emergency to the harness of the pilot and navigator. There is a small folding seat nearby, on the starboard side. Dual control may be fitted for training, but it is not then possible to use the prone bomber's position.

The cabin proper starts behind the pilot's seat and extends rearward as far as the gun turret. Windows of Triplex and Cellastoid now extend for its entire length on both sides, those in the centre being arranged to hinge inboard. Entering the cabin from the forward end one finds the navigator's position, between the spars, on the port side. The navigator has a chair and table, bearing compasses, Bigsworth chart boards, sea markers, course and wind calculators, course and speed calculators, signalling lamp and float flares, all stowed in convenient positions in the cabin. Aft of the rear spar is that portion of the cabin occupied by the wireless operator when he is not working the rear gun. Here, on the starboard side, is a table bearing standard Service W/T apparatus, the trailing aerial winch, parachute pack, fire extinguisher, etc. The fixed aerial sprouts from the fuselage roof behind the cockpit.

A door in the bulkhead at the rear of the cabin gives entry to the Armstrong-Whitworth gun turret, of the type described in *Flight* last week. In this is a Lewis gun and five 97-round ammunition drums. A first-aid box, accessible from the exterior of the machine, is also included.



The main door to the cabin is located on the starboard side just forward of the turret. Two emergency exits are provided in the roof.

Normally the bomb load, which is stowed in the wings, consists of two 100 lb. bombs and four or eight 20 lb. bombs, which are dropped through trap doors. All bombs are released electrically but are fused by mechanical means. If eight 20 lb. bombs are carried instead of four, the petrol load is reduced to 128 gall. and the duration of the aircraft to 4.25 hrs.

Stowed in the tail fairing of the starboard nacelle is an inflatable dinghy which is provided with automatic actuators to the rear of the engine and in the nose of the fuselage. The Walter Kidde system of inflation is used; this makes use of a bottle of liquid carbon dioxide. An emergency release cord is also fitted on the outside of the fuselage. A marine distress signal is provided under a tear-off patch at the bottom of the fin, and two further signals are secured to the handline on the dinghy.

The internal layout of the Anson is clearly shown in Max Millar's double-page drawing, which will be found overleaf.

AVRO ANSON

GENERAL RECONNAISANCE MONOPLANE

Two Siddeley Cheetah IX Engines: 310 h.p. at 6,000 ft.

Dimensions

Span	56ft. 6in. (*17.2 m*)
Length	42ft. 3in. (*12.88 m*)
Height (tail down)	13ft. 1in. (*3.99 m*)

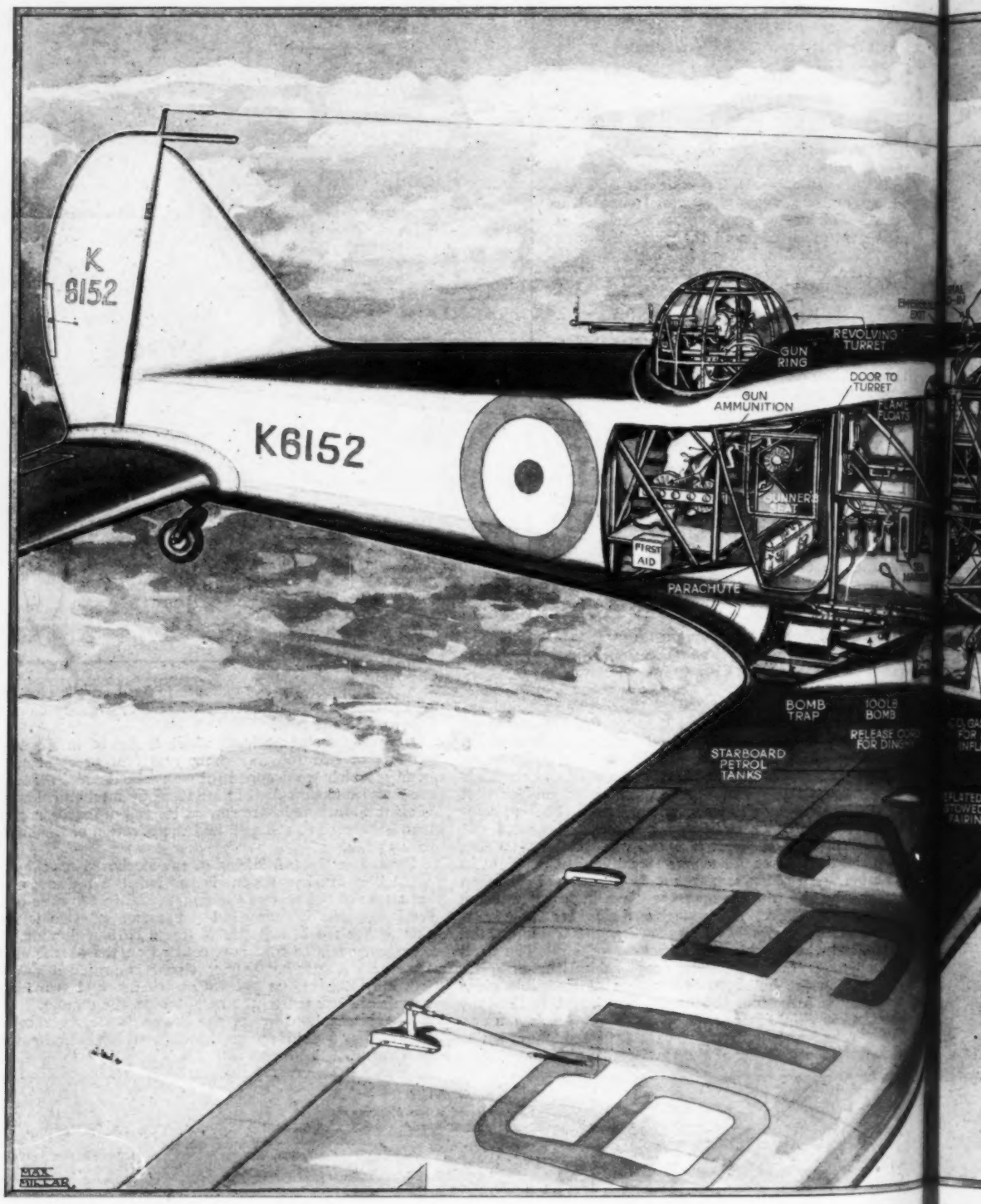
Weights

Weight empty (with flaps)	4,870 lb. (*2209 kg*)
Gross weight (with flaps)	7,650 lb. (*3470 kg*)

Performance

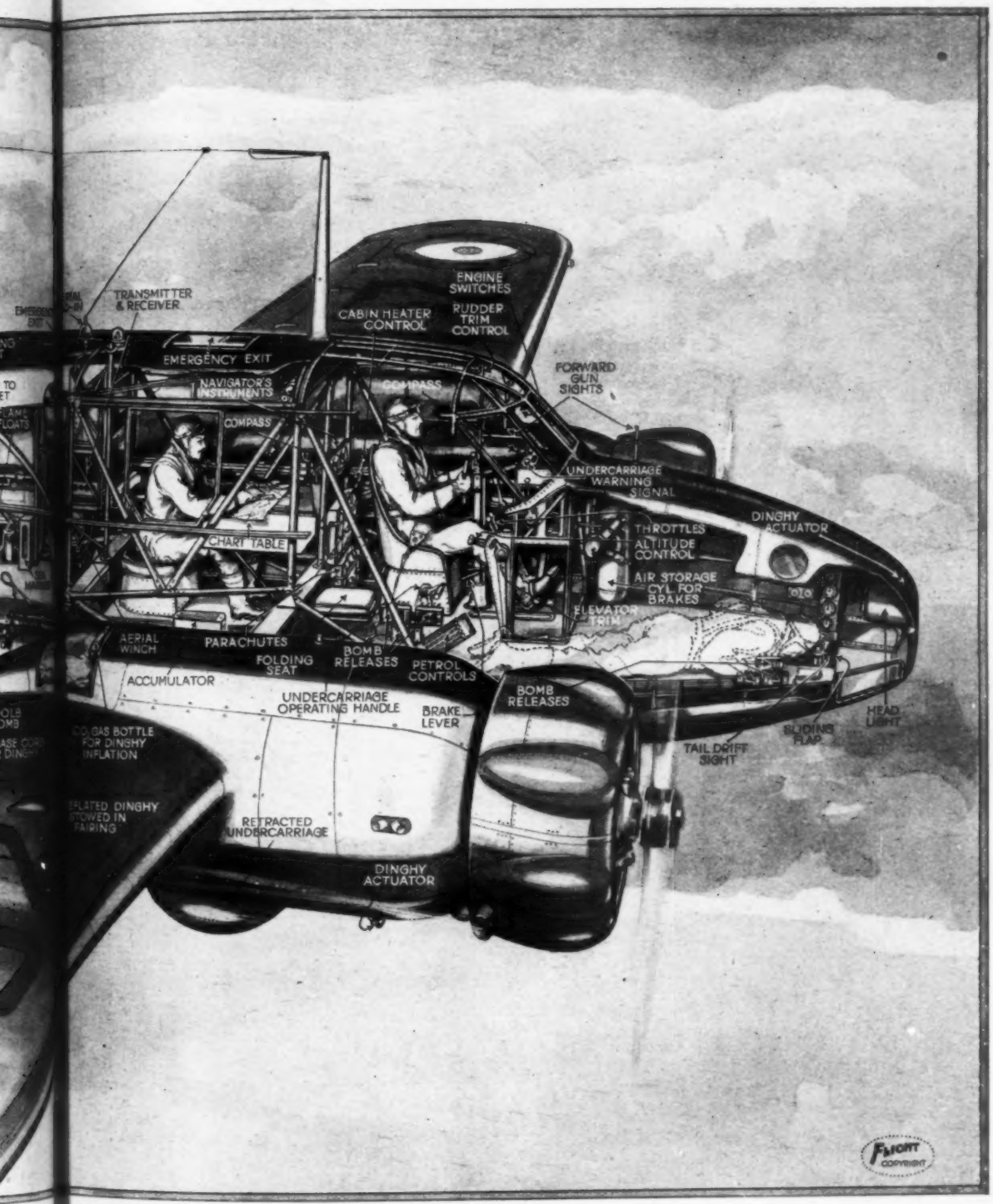
Maximum speed at 7,000ft. (*2130 m*)	188 m.p.h. (*302 km/hr*)
Maximum speed at sea level	174 m.p.h. (*280 km/hr*)
Cruising speed at 6,000ft. (*1830 m*)	160 m.p.h. (*257 km/hr*)
Landing speed (with flaps)	57 m.p.h. (*91.7 km/hr*)
Duration at cruising speed	4.7 to 5 hours.
Climb to 5,000ft. (*1520 m*)	6.1 min.
Climb to 15,000ft. (*4570 m*)	21.2 min.
Service ceiling	21,400ft. (*6522 m*)
Absolute ceiling	24,000ft. (*7315 m*)

FOR GENERAL RECONNAISSANCE DUTIE W



In this *Flight* drawing by Max A. Millar, the majority of the military equipment carried by the Avro Anson (two 310 h.p. Siddeley C … er-water … bomb-aimer. Note, in the nearest engine nacelle, the dinghy which is instantly inflated automatically should the machine make … ng on w … pounders. The breech of the fixed … just vis …

UTI WITH THE R.A.F.—THE AVRO ANSON



Siddeley Cu… …er-water reconnaissance is visible. The figure shown dotted represents the navigator in his alternative position, where he acts as …ine mak… …ng on water. The complete bomb load is not shown: actually this consists of two 100-lb. bombs and four or eight twenty-… …the fixed … just visible to the left of the pilot.

RADIO and AIR TRAFFIC

Direction Finding and its Applications : Homing Equipment and Radio Beacons : Traffic Control : Blind Landing Methods : The Future

By H. A. TAYLOR

The operator's room in Croydon's control tower. Three Marconi sets are used, one being normally reserved for Q.B.I. or "controlled zone" conditions.

IT has become something of a self-evident truism that commercial air-line operation would not be possible without the help of radio. Within the last two or three years, however, the possibilities of largely *automatic* bad weather guidance by means of short-wave beams have been explored, and this comparatively new development, in one form or another, is likely to alter all our ideas of service reliability and of bad-weather safety.

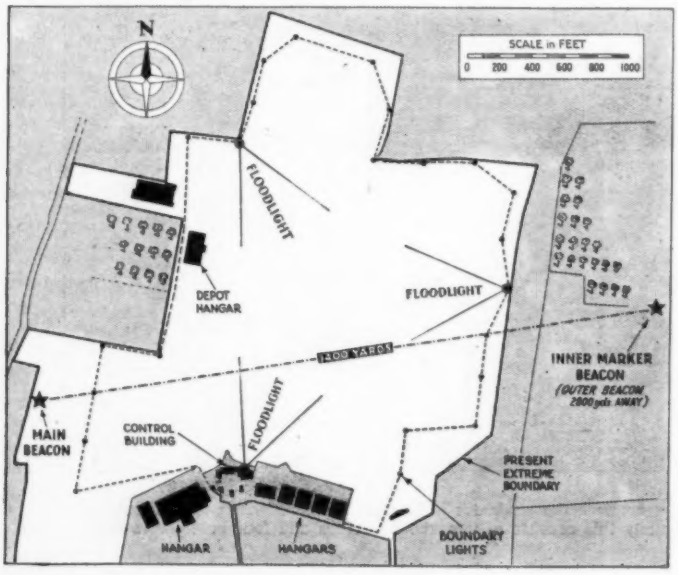
Before the end of ten years every airport will probably have radio and direction-finding equipment and a blind-landing system, while every less important aerodrome will have approach and marker beacons, and every transport aeroplane will be fitted with the necessary complementary equipment. Standardisation is essential, and a method of special training for transport pilots will probably have been developed. Then, and then only, shall we be able to expect the kind of reliability and regularity which has not yet been achieved by any other means of transport.

Medium-wave radio transmission is used, both as a means of communication—for giving weather reports and general information about the whereabouts of other machines and for reporting arrivals and departures—and as a means of direction-finding, position-finding, or of pure "homing." Short-wave radio transmission is being primarily developed for approach beacon work, since these waves are somewhat optical in their characteristics and the field of influence can, in fact, be made to conform to certain general shapes. Obviously, such a characteristic is of invaluable use when machines are approaching an aerodrome in conditions of poor visibility.

Receiving and transmitting sets have been specially developed for aviation work and can be considered to have reached a very high standard of reliability when the extremely difficult operating and installation problems are remembered. In its earlier stages direction finding was subject to very considerable errors, and "night effect," caused by reflections from the ionosphere, is still a serious problem. At sunset and sunrise directional errors as great as 16 or 18 deg. have been experienced even with some of the latest equipment. However, in daylight hours the errors are negligible.

All direction-finding systems have developed from the basic properties of the loop, which, when turned about its vertical axis, is responsive in greater or lesser degree according to its angle in relation to the source of transmission. Broadly speaking, the signals are received at maximum strength when the loop is in line with the direction of wave travel.

When the D/F station is asked by a pilot for his bearing in relation to that station, the pilot either runs his generator or transmits, while the operator on the ground obtains his bearing. A series of such bearings can be used to bring a pilot right up to the airport. Alternatively, if a pilot asks for his position, two or three different radio stations take his bearing and the control officer at the terminal



How the Lorenz blind landing run is arranged at Heston airport. This diagram, which has been drawn by *Flight* from plans supplied by Norman and Dawbarn, shows also the position of the floodlights and boundary beacons. A further extension to the east will be made in the near future.

While the position of the trunk air routes in this country remains, to some extent, in doubt, the use of easily moved D/F stations is an advantage. This is the interior of one of the Marconi mobile units.

airport quickly lays the bearings out on a chart. The point of intersection of the lines gives the machine's position at the moment when the bearings were obtained.

Direction-finding equipment can also be carried by the machine itself, either as a "homing" device—in which case the pilot turns until an instrument tells him that he is flying directly towards any selected radio station—or as a radio compass, by which a pilot may take a direct bearing on any radio station while flying on his original course. Such equipment is of particular value in parts of the world where there are no ground D/F stations within calling distance.

Another form of navigational aid is the visual or aural radio beacon. The words "visual" and "aural" may possibly confuse the uninitiated, since the words apply only to the method of indication as far as the pilot is concerned. The beacon signals tell the pilot whether or not he is flying directly along a previously arranged line of transmission. Such beacons are widely used on American air lines, but in Europe's complicated air-line system, where it is necessary in bad weather for a control officer to keep track of all the different machines in the air, the ground D/F system is considered to be at least temporarily superior.

Supplementary Beacons

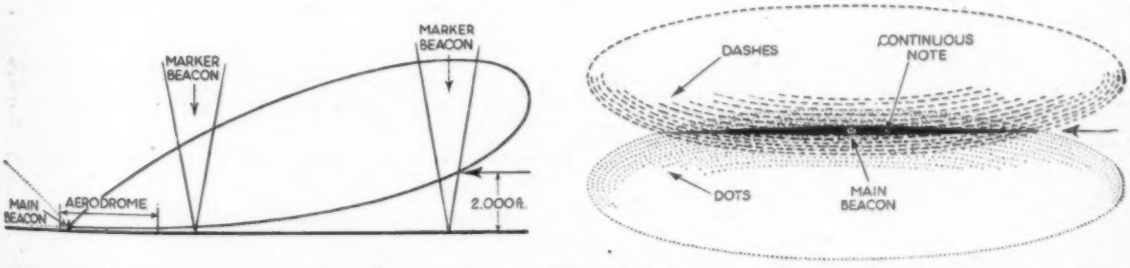
In due course this system will suffer from the effects of overcrowding, and supplementary automatic approach beacons are already installed at a large number of Continental airports, and examples will soon be ready for use at five British airports. European methods have crystallised into a form of "zone" traffic control, in which a control officer at a terminal airport is responsible for the safety of all machines within a certain radius. In bad weather there are small controlled zones around certain airports into which no pilot may fly without first obtaining permission. Again, in due course it may be necessary in the interests of safety to develop a "layer" system for bad weather, whereby each pilot will be given definite height limits between which he must fly.

As already mentioned, the necessity for some system by which pilots can approach and land at an airport when the visibility is virtually zero has hurried research in the matter of short-wave characteristics. The first method to be used, however, for blind approaches in Germany and elsewhere depended entirely on the delivery of continuous bearings by normal means; on the ability of the pilot to fly an accurate course on his blind-flying instruments; and on the accurate aural sensibilities of the control officer. A rough-and-ready method of this kind demands an exceptionally long landing run, such as can only be found at a few airports, in addition to at least one clear approach.

In America the present standardised blind approach system involves the use of a special radio beacon and of two marker beacons (transmitting upwards) at carefully arranged distances from the airport and on the line of approach. By means of a homing receiver the pilot obtains a line on the airport and adjusts his directional gyro; on his approach he uses the marker beacon signals and a previously re-set sensitive altimeter while flying on a memorised series of flying and engine speeds to provide the correct approach angle after crossing the outer marker beacon at a predetermined height. While making his landing actually blind he must fly very gently on to the ground.

The now well-known Lorenz system was developed in Germany and is to be used experimentally at Heston in the very near future. In this system, which involves the use of wavelengths of the order of 8 to 10 metres, accurate directional guidance is automatically given in both the horizontal and the vertical plane from a station at the far end of the landing run, while two marker beacons, laid out on the approach track, tell the pilot his exact distance from the airport boundary.

Briefly the main beacon projects two beams, slightly overlapping in plan view, one signalling in "dashes" and the other in "dots." On the line of overlap a continuous dash is received. These signals can be heard in the pilot's earphones and are, at the same time, used to actuate an instrument on the dashboard which functions more or less



These purely diagrammatical sketches show how the Lorenz blind landing beams are projected. The sketch on the right shows how the signals merge into a continuous note along the approach line. As at present arranged at Continental airports the main beacon marks two courses at 180 deg. to one another.

as a turn indicator. When crossing the marker beacons, a high-pitched " peep-peep " is heard by the pilot above the steady note and, in the original equipment at least, one or other of two pilot lights was illuminated.

Viewed horizontally, the beam is roughly of streamline shape projected in such a way that the lines of equal field strength along the lower edge lie more or less at a normal gliding angle. Another instrument, which indicates field strength, tells the pilot whether he is gliding steadily down the lower edge of the beam. Since the beam runs parallel to and within eight or ten feet of the ground while approaching the transmitter, the pilot has only to keep the signal strength needle steady until the machine actually falls out of the beam and " out of his hands." A sensitive altimeter, of course, can be used as a check on the signal strength indicator.

So far as the installation of radio at an airport is concerned, it is usual to locate the main transmitting equipment well outside, with the masts a least far enough away to form no obstruction to the approaching pilot. The direction-finding equipment is, of course, in or beside the airport, while the normal transmission is carried out by means of remote controls. Needless to say, all the equipment must be approved by the Air Ministry.

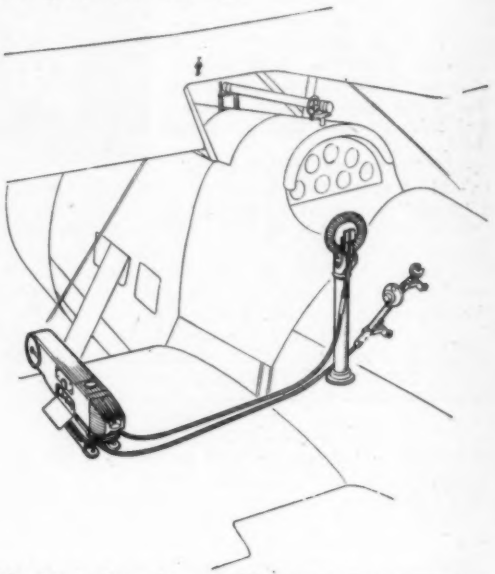
FOR PHOTOGRAPHERS AND FIGHTERS

Cameras and Camera Guns for the R.A.F.

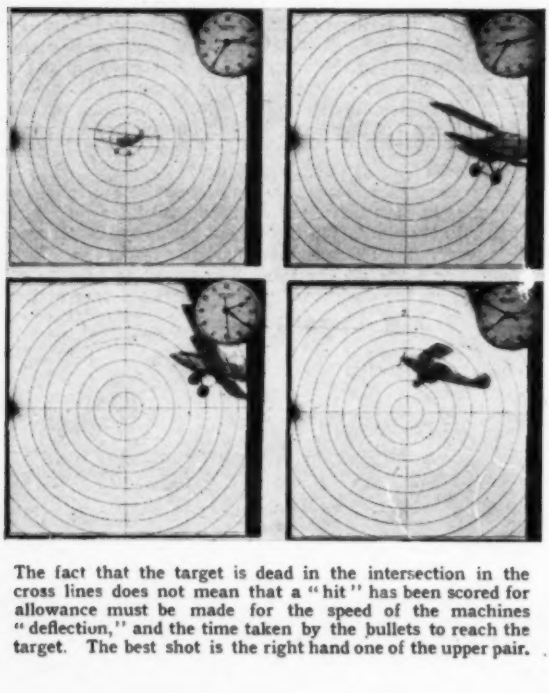
ARMY co-operation machines figure very largely in the Air Ministry's R.A.F. expansion programme, and every one of these must have, as part of its stock-in-trade, an aerial camera. Not " A.C.'s " alone, but reconnaissance machines of the Fleet Air Arm, general purpose types and bombers are all called upon to fly on photographic missions; all of which accounts for the activity at the Willesden Green, London, works of the Williamson Manufacturing Company, Ltd.

The Royal Air Force is standardising a Williamson camera designated the F.24. In the main this model resembles the well-known " Eagle III "; the latter might be regarded, in fact, as a commercial version of the service type, and embodies a number of modern refinements such as the Williamson louvre shutter, which resembles a venetian blind and permits no distortion of the image. The two models differ as well in that the service type takes only one instrument image—of a watch or counter—whereas the " Eagle III " is supplied with a counter, watch, writing tablet and aneroid, permitting photographic records of the exposure number, time, data and height. This information, of course, is of importance in survey work, but is not so necessary in normal military photography.

The service cameras may be used either from a fixed mounting—permitting vertical or oblique photography—or held in the hands. Rolls of film providing 125 exposures are used and the actual photograph is 5in. square. Hand or automatic operation is permitted; in the latter case the exposure is made by a push-button or what is known as a time-switch control box; film winding and shutter setting is accomplished by an electric motor.



This sketch shows how the Williamson G.22 camera gun might be installed on a single-seater fighter. The small door in the side (it is not, of course, left open during flight) gives access to the watch.



The fact that the target is dead in the intersection in the cross lines does not mean that a "hit" has been scored for allowance must be made for the speed of the machines "deflection," and the time taken by the bullets to reach the target. The best shot is the right hand one of the upper pair.

A number of " Eagle IV " cameras (this is an 18cm. x 24cm. model particularly suited to survey work and popular on the Continent) has been supplied for the Royal Australian Air Force.

In addition to cameras, the Williamson Company supplies to the R.A.F. developing and enlarging apparatus and camera guns. The latter are being delivered in two forms—one for pilots' and the other for observers' use—known to the Service as the G.22 and G.28 respectively. These are of recent design and a comparatively small number has yet been seen in the Service.

Both models, although employing similar photographic components, differ very considerably in appearance. The pilots' type is surprisingly small, of smooth contour, and is normally mounted on a wing. It is " fired " by pressure on a trigger in the spade grip of the control column, and the control plunger, which moves a fresh portion of film into position after each " burst " has been fired, represents the reservoir handle of the synchronising gear and trains the pilot to make the movements necessary in actual warfare. For observers' use the photographic portion may be incorporated in an imitation Lewis gun, rather lighter than the actual weapon, but of similar balance.

In both " guns " the image of a watch is shown on the exposure, recording the time at which the trigger was pressed and released and permitting an estimation of the number of rounds fired.

AIRPORT EQUIPMENT REVIEWED

A Guide to the Products of the Firms Showing at the Airports Exhibition and of other Concerns in this Branch of the Industry

The scene of the Airports Conference and Exhibition—British Industries House, near the Marble Arch, London.

Aerodrome Preparation

En-Tout-Cas Co. (Syston), Ltd., Leicester (Stand No. 57).—Some years back this company, which for the past thirty years has constructed parks, greens, sports grounds, etc., decided to undertake aerodrome work. Its exhibition of photographs shows various aerodromes which it has made within the past two years. Details of aerodromes now under construction are also obtainable.

Thomas Green and Son, Ltd., Southwark Street, London S.E.1 (Stand No. 42).—A unit of a gang mower of a type obtainable in single units or gangs of 3, 5, 7, 9 or more units, giving cutting widths from 7 ft. to 20 ft. and upwards; one rough-cut mower for hand-cutting long or rough grass; and one Prince mower for hand-cutting lawns, grass plots, etc., are the exhibits on Stand 42.

C. H. Johnson and Sons, Ltd., Smedley Road, Manchester, 8 (Stand No. 51).—The Johnson half-ton Frog petrol-operated rammer, which is particularly suited to levelling aerodrome runways, is to be seen on this stand. There is, in addition, the Johnson Frama welding apparatus, which should be of interest to those equipping workshops.

Lloyds and Co. (Letchworth), Ltd., Letchworth (Stand No. 39).—A recent type of Pennsylvania gang mower specially designed for aerodrome mowing is this company's exhibit. Various sizes and combinations of mowers are available and have been adopted for use on a number of aerodromes.

W. N. Nicholson and Sons, Ltd., Newark-on-Trent (Stand No. 17).—A harrow, known as the Star-Turn, for the treatment and cultivation of grassland, is the main exhibit on Stand 17. In addition, there is a Cutaway grass harrow and a new harrow of similar type known as the Tearaway. The Star-Turn harrow was awarded the silver medal of the Royal Agricultural Society.

IN an endeavour to make this review as useful a work of reference as possible in regard to aerodrome construction and equipment, "Flight" has included notes on a number of firms which, though not participating in the Airports Exhibition, are likely to be of interest to potential aerodrome owners. For ease of reference, firms have been arranged alphabetically under each subject-heading, first those exhibiting (distinguished by a stand number) and then, again alphabetically, non-exhibitors.

Ransomes, Sims and Jefferies, Ltd., Ipswich (Stand No. 18).—Albums of photographs are available on this stand showing the range of appliances which the company can supply. This includes gang mowers, mole drainers, rotary scrapers, ditchers, and grass rejuvenators. Other items are the Blackburn patent tail trolley and portable hangars.

Alexander Shanks and Son, Ltd., 66, Victoria Street, London, S.W.1 (Stand No. 49).—Suppliers of mowers for cutting the grass on landing grounds and sports grounds, this company is exhibiting a 20 in. Rajah motor mower as typical of its range, which, incidentally, covers all sizes from 14 in. to 42 in. Its other exhibit is a unit of a gang mower. For aerodromes, five, seven or nine of these units, which measure 30 in., are used together.

T. Wilson and Son, Ltd., 65-67, Sheep Street, Northampton. (Stand No. 55.)—This company, which constructed the 150-acre aerodrome at Sywell, is exhibiting a scale model of the aerodrome, together with photographs and drawings of the Reserve lounge and mess, clubhouse, lecture rooms, offices, bungalows, hangar accommodation for twenty machines, stores, workshops, ambulance room, and a scale model of the proposed swimming pool.

Colas Products, Ltd., 105-109, Strand, London, W.C.—Terolas, manufactured by this company, is a binding medium for any kind of earth, loamy sand, hoggin, ashes, gravel, shingle, chalk, pit and sea sand, scarified road material, etc. It is used largely for aerodromes and provides, it is claimed, a dustless, waterproof and durable surface.

The "Frog" rammer, made by C. H. Johnson and Sons, Ltd. (Stand 51), is petrol operated; it jumps about 14 in. upwards and 8 in. forwards at each power stroke.

Edward Webb and Sons (Stourbridge), Ltd., Wordsley, Worcs.—The seeding of aerodromes is a very specialised job, not only in regard to the actual seeding operations, but more because of the particular varieties of grasses necessary. This company has supplied very large quantities of seeds to the Air Ministry and, in addition, manufactures turf fertilisers which have also received wide official recognition.

Buildings, Building Accessories and Materials

Boulton and Paul, Ltd., Norwich. (Stand No. 9.)—Many of the hangars and aerodrome buildings erected by this company are shown in photographs. Boulton and Paul, Ltd., were responsible for the steel-work of the workshop hangar at Heston, the large wind tunnel at Farnborough, and the factory and offices of Saunders-Roe, Ltd., at Cowes.

Cellactite and British Uralite, Ltd., 296-302, High Holborn, London, W.C.1. (Stand No. 34.)—This firm is exhibiting its Cellactite asbestos-protected metal roofing and roof ventilators, widely employed at aerodromes. Cellactite is particularly suitable for very large sliding doors, being light yet unbreakable as well as incorrodible.

Cellon, Ltd., Kingston-on-Thames, Surrey. (Stand No. 11.)—The Cellon exhibits comprise a complete range of synthetic painting materials for all protective and decorative paint work. Cerrux decorative finish has been used on a number of very large aerodrome buildings, including the Hawker hangar at Brooklands, the terminal buildings and hangar at Shoreham, the 500-ton workshop hangar at Heston, and the new Saunders-Roe works at East Cowes.

The Educational Supply Association, Ltd., 171-181, High Holborn, London, W.C.1. (Stand No. 7.)—The Esavian exhibit consists of a model of an aerodrome hangar fitted with Esavian folding and sliding doors of a type which will be actuated electrically to show their method of operation.

The Fairby Construction Co., Ltd., Africa House, Kingsway, London, W.C.2. (Stand No. 66.)—In order to illustrate the enormous extent of the work already done by it for the aircraft industry, this company is showing plans and photographs. It also describes the methods used to ensure the rapid completion of any particular job undertaken.

John Hall and Sons (Bristol and London), Ltd., 173, Pancras Road, London, N.W.1. (Stand No. 26.)—A new flat wall finish called Murac is shown on this company's stand. It is claimed that the actual surface is as hard as a gloss paint, enabling the material to be washed, rubbed, or even scrubbed. Brolac paint and Hall's Anti-Rust Primer, intended to arrest corrosion and rust, are also shown on this stand.

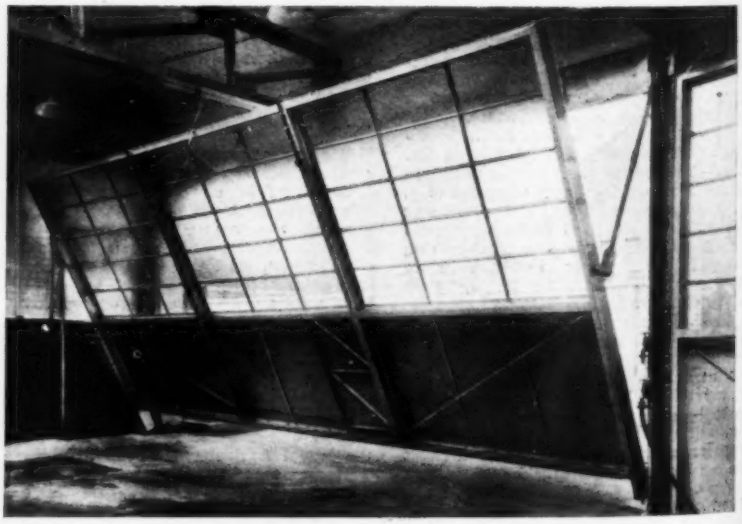
Llewellyn Ryland, Ltd., Balsall Heath Works, Birmingham, 12. (Stand No. 4.)—The following exhibits are laid out on this company's stand: anti-corrosive and decorative specialities for steel work, wood, asbestos sheeting, etc.; metal panels of Titanic paint showing results of twenty-four years' exposure; steel girders protected with Ardak synthetic aluminium scheme; metal windows in Ardak synthetic green finish; examples and particulars of Rubrox anti-corrosive rubber paint, and Rhelglos decorative enamels.

London and Midland Steel Scaffolding Co., Ltd., Iddesleigh House, London, S.W.1. (Stand No. 62.)—In addition to samples of portable scaffolds and tripods of a type used widely in the aircraft industry, this company is showing Burton's patent double-grip system of steel tubular scaffolding, castor wheels, adjustable shores and trench shores.

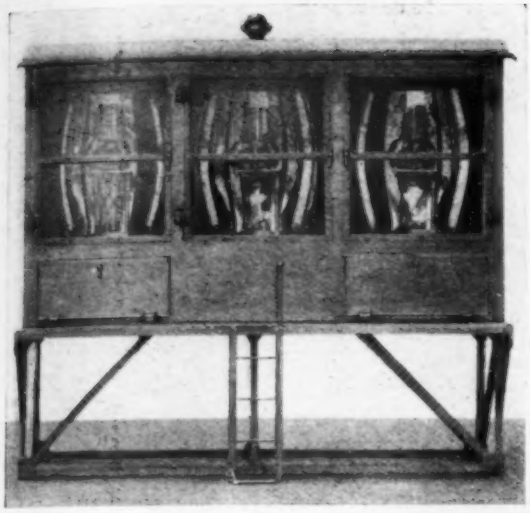
Nissen Buildings, Ltd., Hoddesdon, Herts. (Stand No. 5.)—Photographs and drawings of various types of buildings in which Nissen construction has been utilised are on show on this stand. Nissen construction is suitable, not only for hangars, but for workshops, stores, canteens, etc. The buildings can be supplied in spans ranging from 15 ft. to 50 ft. in any length.

Northern Aluminium Co., Ltd., Aldwych, London, W.C.2. (Stand No. 41.)—This company has developed a new aluminium paste consisting of flakes of aluminium prepared by a special process and bound by a mixture of spirits. The paste is admirably suited for the internal painting of aerodrome buildings, giving an excellent finish and high reflecting power. A sample of aluminium alloy roller shutter is also on show.

Pinchin, Johnson and Co., Ltd., 4, Carlton Gardens, London, S.W.1. (Stand No. 53.)—Protective and decorative finishes which can be obtained with the Vigorised oil paints manufactured by this company are shown. The saving of time made possible by the wet-on-wet treatment is given emphasis; any number of coats, it is claimed, can be sprayed on with only one hour between coats.



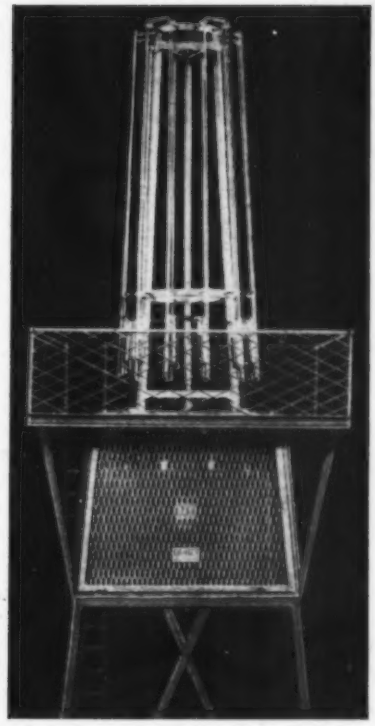
The Eclair hangar door, made by Hawkes and Snow Ltd., swings upward to lie flat against the ceiling.



(Left) An example of Chance Bros. floodlighting practice—the 4½ kW. unit, a model of which appears on Stand 46.

Right) An aerodrome beacon by Clarke, Chapman and Co., Ltd., who are exhibiting on Stand No. 10.

(Below) A Neon-type beacon by the General Electric Co., Ltd.,



A. Jackaman and Son, Ltd., 13, Mackenzie Street, Slough.—This firm has been responsible for constructing many well-known aerodrome buildings, including some at Heston and at the new Gatwick Airport.

Titanine-Emaillite, Ltd., Colindale, London, N.W.9. (Stand No. 61.)—Manufacturers of Titanine dopes also supply materials for the protection of all forms of metal work and woodwork, and for decorative purposes. Their stand bears sections of structural steel work, etc., coated with Lumilac synthetic undercoat and Lumilac synthetic finish.

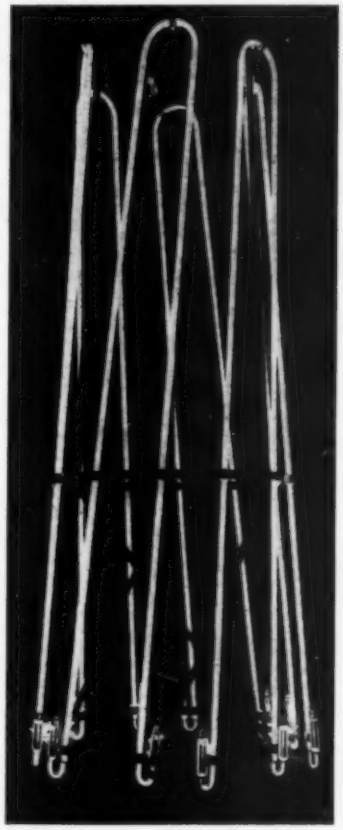
Lewis Berger and Co., Ltd., Homerton, London, E.9.—This company makes varnishes, colours, distempers, cellulose and synthetic enamels, all of which should find a variety of uses in aerodrome buildings.

Boston Blacking Co., Ltd., Ulverscroft Works, Leicester.—It is claimed that Bostik, which is the only adhesive plus sealing compound that successfully seals windows in cabin machines, can perform a corresponding function in the equipment of aerodromes. A special grade of Bostik cement secures rubber flooring.

Arthur L. Gibson and Co., Ltd., Twickenham. -- Kinnear patent steel rolling-shutters are of use on all manner of wide openings, and have been applied to the hangars of H.M.S. *Hermes* and H.M.S. *Furious*. They have been supplied for a number of hangars.

Hawkes and Snow, Ltd., Shirley, Birmingham.—The ingenious Eclair balancing doors made by his company have been manufactured in all sizes up to 110 ft. in width. When in the fully opened position they lie flat below the ceiling. They can be made to open entirely inside the building, or to project some distance outward.

Horsley Bridge and Thos. Piggott, Ltd., Tipton, Staffs.—The Lamella steel roof construction should be of great interest to those contemplating the erection of buildings at aerodromes. It is described by the manufacturers as a scientific development in the architecture of steel.



Lighting and Electrical Equipment

Benjamin Electric, Ltd., Tariff Road, London, N.17 (Stand No. 19).—For use with gas-filled electric lamps, electric discharge lamps, and Class B.I. floodlight lamps, this company produces a variety of reflector equipment, and is exhibiting appropriate examples.

Callender's Cable and Construction Co., Ltd., Victoria Embankment, London, E.C.4. (Stand No. 14.)—Callender's are specialists in the manufacture of all types of electric cables. They are showing examples of cables suitable for supplying current to portable electrical machinery, for delivering currents of 200 to 600 amperes for electric welding apparatus, samples of paper and rubber insulated cables for lighting and signalling purposes, and all types of electric cable and flexible for aircraft and aero engine use.

Cardiff Foundry and Engineering Co., Ltd., Hurman Street, Cardiff (Stand No. 64).—The "Pillar of Fire" boundary beacon, which has been approved by the Air Ministry, is the central exhibit on the stand of this company. Should an aeroplane hit such a beacon it is claimed that no damage to it (the aeroplane) will result, for a pressure of as little as 10lb. will break one of the three wires supporting the beacon, and the two unbroken ones will pull the pillar over, destroying the contact.

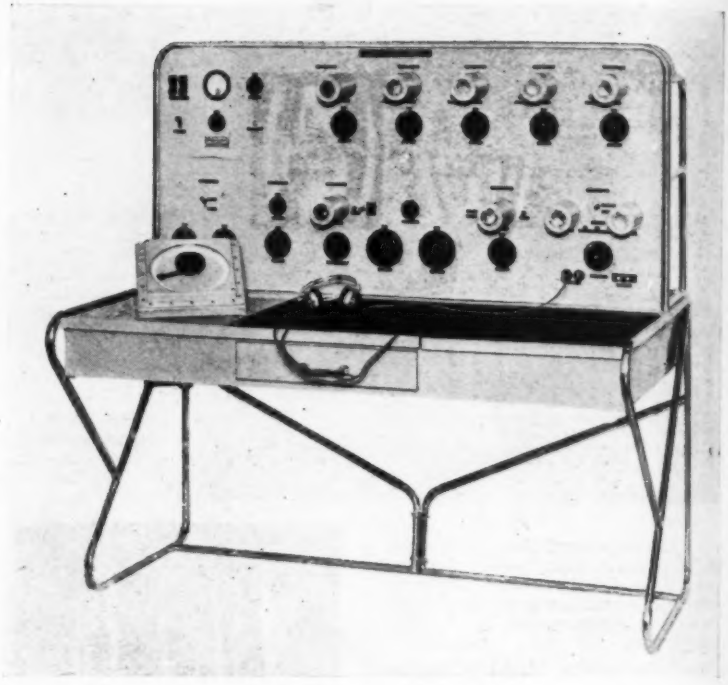
Chance Bros. and Co., Ltd., Lighthouse Works, Smethwick, Birmingham (Stand No. 46).—On the stand of this company (which has made its name in marine lighthouse construction and is still the leading British firm in that business) there will be found an illuminated-cone boundary light, its latest type of obstruction light, a model of a 4½-kW. aerodrome landing floodlight, and a model boundary light, such as is installed at Heston and a number of aerodromes abroad. Chance Bros. manufacture all types of equipment for the lighting of aerodromes and airways, including beacons and illuminated wind indicators, and are in a position to quote for and supply automatic unattended beacons, complete with generating sets, giving up to eight weeks' running without attention.

Chloride Electrical Storage Co., Ltd., 137, Victoria Street, London, S.W.1o. (Stand No. 29).—The "Keepalite" emergency lighting system provides instantly and automatically a source of electric light when the main supply fails, and the above company is exhibiting equipment designed to supply an emergency load of 1,500 watts for one hour. Although the stand-by storage battery provides only D.C., which is, if used directly, unsuitable for boundary lights and Neon beacons, it can supply the necessary A.C. in emergency by use of a small rotary converter which starts automatically the instant the mains fail. In addition, there are various batteries and torches and a Type C portable projector.

Clarke, Chapman and Co., Ltd., Victoria Works, Gateshead, Co. of Durham (Stand No. 10).—A floodlight, beacon, obstruction lights, boundary light, illuminated wind direction indicator, and stand-by lighting equipment for aerodromes, will all be shown on the stand of this company. In addition to these items, Clarke, Chapman and Co. manufacture all classes of rotating searchlight beacons, ceiling lights, generating plants, switchboards, and mobile floodlighting equipment.

Troughton and Young, Ltd., 143, Knightsbridge, London, S.W.1 (Stand No. 58).—The exhibit of this company, which specialises in lighting, heating and power installations, refrigeration, radio, etc., is extremely simple, taking the form of a model of an aircraft factory designed by Mr. E. A. D. Tanner, A.R.I.B.A., for Godwins (Estate Developments), Ltd. Troughton and Young, incidentally, are the electrical contractors to the new Gatwick airport.

The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Most of the lighting devices for night flying at Gatwick aerodrome have been supplied by The General Electric Co., Ltd., which has fitted out many of the principal aerodromes in this country, as well as on the Empire routes. In the main, the lighting equipment at Gatwick is similar to that installed by the Company at Croydon, and comprises a G.E.C. Neon beacon and beacon tower, wind indicator, boundary and obstruction lights and poles, cables, switch gear and controlling apparatus and Osram lamps.

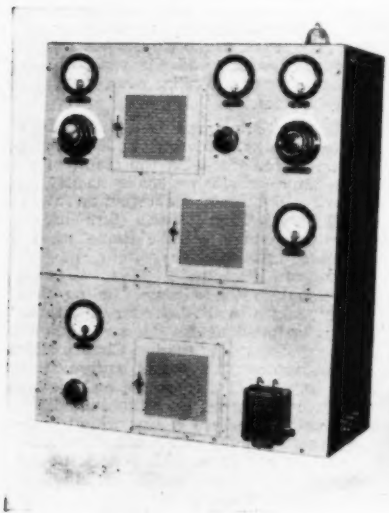


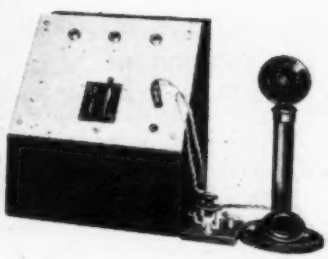
A feature of the Marconi display on Stand 45 is this Type DFG10 airport receiving equipment for D/F. and similar work.

Tannoy Products, Canterbury Grove, London, S.E.27.—Some interesting loud speaker equipment for transmitting directions in the booking halls of aerodromes and instructions to the ground staff, have been developed by this company. It has been installed in the booking hall at Croydon, and some notable developments are imminent.

Radio

Gambrells, Rowse and Snoaden, Ltd., 3, St. James's Square, London, S.W.1. (Stand No. 27.)—For aerodrome use this company is producing a variety of radio installations, and of these will be exhibiting the Type 581 transmitter, which has an anode rating of ½ kW., and covers medium and short wavebands as required, using either C.W. or I.C.W. telegraphy or telephony with rapid change-over between systems. Other standard items of G.R.S. equipment range from ½ kW. mobile stations to 3 kW. installations. All transmitters can be arranged for remote operation over a land line.

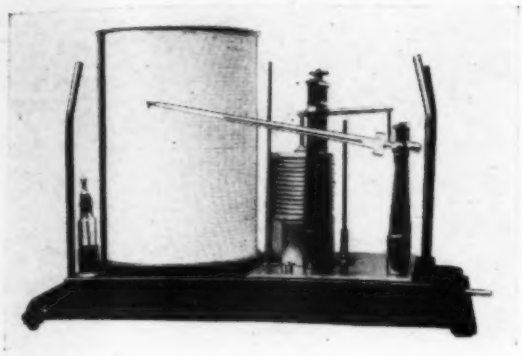




The Type MWO.5C ground transmitter, with remote control, which is being shown by Radio Transmission Equipment Ltd. on Stand 25

Marconi's Wireless Telegraphy Co., Ltd., Electra House, Victoria Embankment, London, W.C.2. (Stand No. 44.)—Over 90 per cent. of British civil aerodromes are fitted with installations by this pioneer firm. The apparatus on show is an aerodrome receiver, Type DFG10, designed for use either with the Marconi-Adcock anti-night-error aerial system or with loop aerials. Included in the Marconi range is a new ultra-short wave, or so-called "blind" approach beacon apparatus, enabling aircraft to approach aerodromes with confidence when visibility is low. Marconi mobile stations are also available.

Radio Transmission Equipment, Ltd., 111, Charing Cross Road, London, W.C.2. (Stand No. 25.)—An aerodrome transmitter, Type MWO.5C, and a direction-finding receiver, Type 0813, together with direction-finding loop aerials and transmitter remote control unit, will be found on the stand of this company. The MWO.5C transmitter is of the medium-wave low-power type for operation on telegraphy or telephony, and is intended for communication with aircraft over an area of 50 to 60 miles for local control during fog.



The Short and Mason large-size micro-barograph, as used by the Meteorological Office.

Standard Telephones and Cables, Ltd., Aldwych, London, W.C.2. (Stand No. 39.)—For reception of a wavelength of 13.5 to 250 metres, this company is making, and will show, the R.M.16 equipment and the R.M.17 for operation on wavelengths from 250 to 5,000 metres. Other items will be the Lorenz approach landing equipment, the Standard Adcock direction finder, and T.S.4 and M.5 transmitters.

Transreceivers, Ltd., 444, Ewell Road, Surbiton, Surrey.—The Hermes Midget Transreceiver is a self-contained portable ultra-short-wave transmitter and receiver combined. Communication from the aerodrome control to an aircraft is easily effected, and a two-way telephony conversation between, say, a pupil and an instructor, is another obvious application.

Aerodrome and Meteorological Instruments

W. and T. Avery, Ltd., Soho Foundry, Birmingham. (Stand No. 31.)—These well-known manufacturers of scales, balances and kindred instruments have on their stand appropriate items for aerodrome use.

Kelvin Bottomley and Baird, Ltd., Lloyds Avenue, London, E.C.3. (Stand No. 30.)—The K.B.B. exhibits comprise a landing compass for use on aerodromes in connection with the checking and compensation of aircraft compasses and for taking field observations; standard K.B.B. Pneumercator gauge outfits for various tanks; and a K.B.B. Pneumercator gauge specially made for use with petrol tanks either underground or overhead.

Negretti and Zambra, 38, Holborn Viaduct, London, E.C.1. (Stand No. 20.)—On this stand there are the following instruments: wind velocity and direction recorder, standard barometer, aneroid barometer, recording barometer, micro-barograph, bimetallic recording thermometer, Stevenson screen, and a model of a climatological station.

Short and Mason, Ltd., Walthamstow, London, E.17. (Stand No. 28.)—The following instruments are displayed, among others, on the stand of this firm: Micro-barographs, including a large-size model for the Meteorological Office, stormographs (barographs), stormo-thermographs, thermographs, hydrographs, anenometers, rain gauges, Stevenson's screen, meteorological thermometers, mercurial barometers, electrical wind direction indicators, sensitive sub-standard test altimeters, meteorograph, engineering aneroids, and incidence gauges.

Tyme, Ltd., 5, New Bond Street, London, W.1. (Stand No. 74.)—The central exhibit on this stand is a large clock intended for club rooms, etc., and made in the form of an aeroplane, the hands being formed by the airscrew and the "hours" by the cylinders. There is a smaller model, measuring 2 ft. in width, on similar lines. Watches and recording stop-watches are also on view.

Workshop Equipment

E. P. Barrus, Ltd., Upper Thames Street, London, E.C.4. (Stand No. 45.)—This company are sole concessionaires for numerous proprietary articles. They are showing Champion air-compressors and tyre inflation meters; Porter swivel-head cutters, bolt clippers, nut splitters and wire-rope cutters; Aro lubrication equipment; Van Norman boring bars, valve refacers and decarbonising equipment; Starrett precision measuring instruments; Blackhawk wrenches and wrench sets; Mariol Powerlites and Powerflares; Stanley electric drills, shears, grinders, screwdrivers and hammers; and Stromberg vacuum-testing and engine-testing equipment.

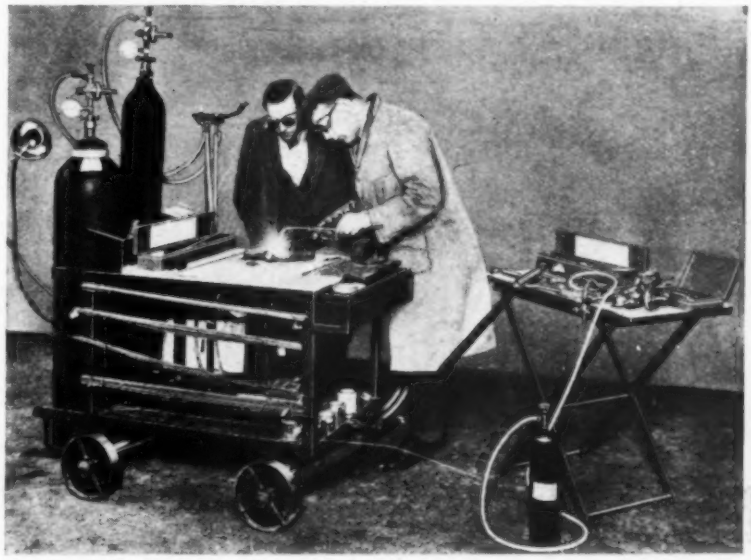
British Belting and Asbestos, Ltd., 59, Southwark Street, London, S.E.1. (Stand No. 43.)—The products being exhibited on Stand 43 can be divided into three varieties—beltings, brake linings and asbestos products. Three types of belting figure in the exhibit; the brake linings meet a wide variety of requirements, and the asbestos products include mitts and smothering blankets for extinguishing localised fires. To complete the range a number of Phœnix packings are displayed.

Broom and Wade, Ltd., High Wycombe. (Stand No. 52.)—This company manufactures single-stage and compound air-compressors from 8 to 3,000 cubic ft./min. capacity and pneumatic tools. As representative of their compressors, they are exhibiting one of 80 cubic feet capacity. Additional items are pneumatic tools, such as riveters, drills and grinders.

Brown Bros., Ltd., Great Eastern Street, London, E.C.2. (Stand No. 75.)—In addition to photographs, the stand of this ubiquitous firm contains, among other items, electric drills, electric polisher and grinder, axle stand, welding outfit, lights, jacks, oil tray, B.E.N. Pneuflator and spray painting outfit, spanners, reamers, punches, wrenches, compressors, valve refacer, air transformer, storage racks, machine tools, etc.

V. L. Churchill and Co., Ltd., Walnut Tree Walk, London, S.E.11. (Stand No. 38.)—The V.L.C. exhibit will mainly comprise tools and equipment for workshop and service use. There will be a universal valve refacing machine of a type in use at numerous aerodromes, an air-operated valve grinder, and specimens of blow guns, cleaning guns, lubrication equipment, sets of battery tools, feeler gauges, a mechanical press, airline couplings, and an exhibit showing the "U"-type Parker Kalon screws.

R. H. Cook and Co., Ltd., 209, Broadway, Hendon, N.W.9. (Stand No. 67.)—Specialists in all types of equipment covering modern service stations, engineers' workshops, battery charging plants and the like, R. H. Cook and Co., Ltd., under the supervision of the



Acetylene welding equipment—one of the many "lines" handled by Brown Bros. Ltd. (Stand 75).

managing director, Mr. R. H. Cook, are producing a comprehensive range of articles associated with the equipment of these plants. One outstanding item is the R.H.C. aerodrome floor crane.

Desoutter Bros., Ltd., The Hyde, Hendon, London N.W.9. (Stand No. 76.)—This company specialises in portable electric and pneumatic tools. Their electric drill guns, of which there are now several new models, range from 3/16 in. to 5/16 in. capacity tools, and are of extraordinarily low weight, e.g., 2½ lb. for a 3/16 in. drill running at 5,000 r.p.m. There are also two examples of the useful corner drill gun for inaccessible positions, together with the electric screw gun, for high-speed screwdriving and nut running. Finally, there is a full range of heavy-duty machines up to 1½ in. capacity.

On the pneumatic side, there is a range of drills from 3/16 in. machines weighing only 2 lb. to ⅝ in. types weighing 3 lb. There is also a pneumatic screwdriver and high-speed grinders.

Felco Hoists, Ltd., 17, Victoria Street, London, S.W.1. (Stand No. 73.)—The Felco exhibits consist of all-steel triple-gear chain blocks, travelling trolleys and travelling chain blocks, and "Ropelock" rope pulley hoists. In the triple gear chain blocks all castings have been superseded by solid steel parts. The chief feature of the travelling chain block is the very short headroom required.

Kurt Erlach, Ltd., 2, Melior Street, London, S.E.1. (Stand No. 69.)—The main exhibit of Kurt Erlach, Ltd., is their portable electric Volspray 1A/2 painting equipment, as used at a number of British and foreign aerodromes. Although very compact, it operates a full-sized gun for dopes, paints and varnishes. Larger models and allied equipment are also shown.

Lacy-Hulbert and Co., Ltd., Beddington, Croydon. (Stand No. 60.)—Perhaps the most interesting item on the Lacy-Hulbert stand is the portable petrol-driven compressor set. Sets of this type have been supplied to Imperial Airways for riveting and spraying. There are, in addition, stationary and portable air compressors of different sizes and for a variety of uses, together with air filters, gauges, cocks and hose.

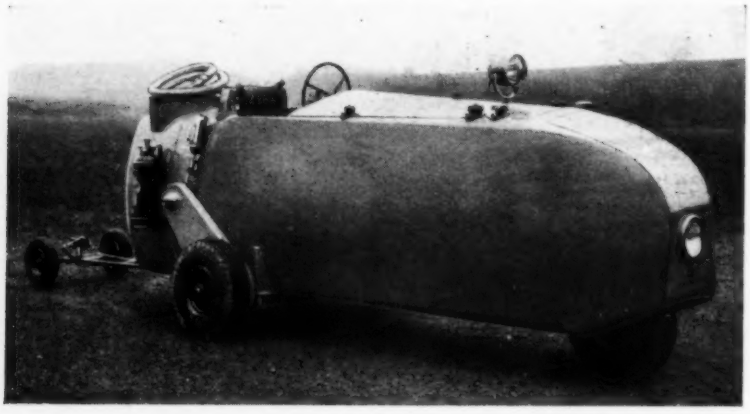
Morris and Ingram, 26, Finsbury Square, London, E.C.2. (Stand No. 2.) Engine-reconditioning equipment will form the display of this firm, which represents British and American manufacturers in Europe and North Africa. Hall-brand tools will be eccentric valve seat grinders, hand- and power-operated valve seat inserter sets, valve seat dial gauge, cylinder ridge reamer, abrasive cloth hones, and cylinder hones. There will be, in addition, a Sioux valve face-grinding machine, and a B.T.S. connecting rod aligner.

Large-capacity Zwicky refuelling units, as used by the R.A.F. Zwicky Ltd. are exhibiting on Stand 35.

John B. Pillin, Ltd., Beckenham, Kent. (Stand No. 71.)—Air compressors and lubricating equipment are produced by this company, which is exhibiting its two-stage two-cylinder 24 cu. ft. compressor suitable for operating drills, screwdrivers, blow guns, hammers, etc. There is also a portable combined compressor and chassis lubricator, and a combination penetrating oil sprayer and blow gun.

Aerograph Co., Ltd., Lower Sydenham, London, S.E.26.—Pioneers in spray painting, this company is producing a plant known as the Aerograph type A.D. Portable, which is ideal for refinishing aeroplanes or for aerodrome maintenance purposes. The De Vilbiss type MBC spray gun is another item which is used extensively in aeroplane factories for the application of dope.

Ingersoll-Rand Co., Ltd., 165, Queen Victoria Street, London, E.C.4.—Apart from the contractors' heavy air-compressors for which it is so well known, this company makes workshop compressors for such purposes as dope and paint spraying, tyre inflation, engine cleaning, and the operation of small pneumatic tools. It has supplied a number of 5 h.p. two-stage air compressors to aerodromes, and also deals in small multi-vane drills and grinders.



A typical mobile refuelling unit made by Thompson Bros. (Bilston) Ltd. (Stand No. 1).

Wm. Turner and Bros., Ltd., Eyre Works, Sheffield.—Products of this company particularly suited to aerodrome use are the Kismet E.45 automatic compressor plant with Kismet 99A air tank outfit, Kismet trolley compressor, Kismet duoflator, Kismet Duplex foot pump, Kismet balloon-tyre pressure-gauge, and Kismet aero-tyre pressure-gauge.

Fuel and Oil Equipment

The Anglo-American Oil Co., Ltd., Westminster, London, S.W.1. (Stand No. 72.)—Although none of their actual products will be displayed, this company is receiving visitors and giving advice on the storage and distribution of their products at aerodromes.

Hammond Pump and Equipment Co., Ltd., Victoria Road, London, N.W.10. (Stand No. 24.)—The Hammond Electroil meter for aerodrome use has a discharge arm fitted with a 360 deg. swivel enabling the hose to be taken up into the aeroplane. To fill an aero engine sump, the filler simply depresses the trigger lever after having started up the motor in the unit and delivers the exact quantity of oil.

Shell-Mex and B.P., Ltd., Strand, London, W.C.2. (Stand No. 8.)—There is an Avery-Hardoll electric metering pump on this stand, together with Aero Shell mobile lubricating equipment as employed on a number of aerodromes, and bottled specimens of lubricating oil.

Silvertown Lubricants, Ltd., West Silvertown, London, E.16. (Stand No. 33.)—This company is showing a new light type trolley to carry 10-gallon drums, a portable drum cover supplied with its 25-gallon drums and a sample of Speedolene aero engine oil. The carrier trolleys are loaned to clubs to aid in the dispensation of Speedolene engine oil.

The Streamline Filter Co., Ltd., Ingate Place, London, S.W.8. (Stand No. 36.)—The smallest vacuum-operated filter made by this company is exhibited, together with a model for small private aerodromes. This latter type is operated by compressed air. There is a model to show how the filtration is effected and the reversal process which relieves the filter of accumulations.

Superflexit, Ltd., Trading Estate, Slough, Bucks. (Stand No. 63.)—One of the main items on the Superflexit stand is a Zwicky hand-operated petrol pump, to which will be fitted a sample of 2 in. type F. heavy duty petrol hose, a sample of 1½ in. bore type W. petrol delivery hose, and a sample of 1½ in. type T. red oil delivery hose. All these types are used extensively by the R.A.F.

Tecalemit, Ltd., Brentford, Middlesex. (Stand No. 40.)—Tecalemit exhibits comprise heating apparatus for aero engine oil, a display of the Tecalemit system for refuelling aircraft (this is claimed to eliminate fire risk, to avoid all leakage, to prevent evaporation losses, and to make possible a general speeding-up), and models demonstrating the Tecalemit rolling tank petrol supply system.

Thompson Bros. (Bilston), Ltd., Bilston, Staffs. (Stand No. 1.)—Photographs of refuelling units in the Thompson range are shown. Perhaps the most notable types in this range are, first, the T.B. Mobile unit, which comprises a 350-gallon tank mounted on three wheels and driven by an 8 h.p. petrol engine with three-speed gear box, and, secondly, the T.B. Sussex, a 700-1,000-gallon capacity tank mounted on a Ford Sussex or similar chassis.

C. C. Wakefield and Co., Ltd., Cheapside, London, E.C.2. (Stand No. 65.)—An engine oil dispensing unit, a combined greaser and tyre inflator, a Castrol Drainoil tank, air-compressors, and examples of Patent Castrol oils are to be found on the stand of these well-known lubrication specialists.

Wayne Tank and Pump Co., Ltd., Newlands Park, London, S.E.26. (Stand No. 13.)—The Wayne stand contains an electric meter pump, as supplied to a number of aerodromes, with the addition of a swing-arm intended for attachment to a suitable post or hanger. There is also an aircraft refuelling pit which is a self-contained unit located in any convenient spot and supplied with petrol by an independent motor-driven pump.

Zwicky, Ltd., Slough, Bucks. (Stand No. 35.)—Owing to the fact that its large refuelling units are too bulky for exhibition this company is contenting itself with showing photographs of them, and examples of hand pumps for refuelling, nozzles and filters. The range of large refuelling units is, of course, very comprehensive.

Fire Fighting and Crash Equipment

Auto Fire Protection, Ltd., Victoria, London, S.W.1 (Stand No. 68).—A mechanical Airfoam pump capable of delivering 400 gallons a minute, which has been chosen by the Air Ministry for a new type of accident tender, is being exhibited on this company's stand, together with manual equipment and illustrations of tests. The stand is being shared by The Walter Kidde Co., Ltd., who specialise in fire-fighting with carbon dioxide.

Bell's Asbestos and Engineering Supplies, Ltd., Slough (Stand No. 48).—A full range of asbestos products which have been developed for fire fighting is displayed on this company's stand. The latest types of "Bestobell" fire-fighting clothing will be shown for the first time. Additional items will be asbestos folding shields and screens, helmets, gloves and smother blankets. Apart from these, there will be samples to illustrate a new process for applying asbestos, which has made it possible to use this material for soundproofing and fireproofing aeroplanes.

General Fire Appliance Co., Ltd., 11, Queen Victoria Street, London, E.C.4 (Stand No. 12).—The 30-gallon Bromylene extinguisher with patent spreader, methyl bromide and Vixen carbon tetrachloride types in quart sizes, the 2-gallon Fire Froth extinguisher, and various items for rescue work go to make up the interesting exhibit of this company.

Gwynne's Pumps, Ltd., Hammersmith, London, W.6. (Stand No. 50.)—The Gwynne portable trailer fire-fighting unit, the pump of which is driven by a four-cylinder petrol engine and has twin series discharge branches is to be found on this company's stand.

National Fire Protection Co., Ltd., Petersham Road, Richmond, Surrey (Stand No. 59).—This company's principal exhibit will be a new aerodrome-type first-aid trailer, consisting of an 8-cwt. chassis on which is mounted four 3-gallon cylinders of methyl bromide in pairs delivering through two 30-ft. quick-release hose coils. In addition to smaller extinguishers there is a full set of aerodrome first-aid equipment.

Pyrene Co., Ltd., Brentford, Middlesex (Stand No. 32).—The main feature of this exhibit is a Phomene horizontal-type foam fire-engine conforming with Air Ministry requirements. The Pyrene methyl bromide extinguisher is also displayed, together with the two-gallon size Pyrene pump-type extinguisher, a range of Phomene extinguishers for oil and spirit fires and Conquest soda-acid types for general fire risks. Hoses, hydrant valves, branch pipes and complete crash equipment make up this exhibit.

Miscellaneous

Airco, Ltd., 18-20, Lower Regent Street, London, S.W.1. (Stand No. 6.)—This firm, which specialises in the supply of all airport and clubhouse equipment, aircraft spares, workshop supplies, clothing, maps, books, etc., include the following on their stand: fire extinguishers, first-aid equipment, oil and petrol funnels and measures, petrol and water hose, small tools, Elsan portable chemical closet, cutlery, club furniture, glues, dopes, fabrics, nuts, bolts and washers, Perfix ignition terminals, overalls and civil air ensigns.

Architectural Services, Ltd., Victoria Street, London, S.W.1. (Stand No. 54.)—Photographs, drawings, data and models of Chisarc construction are to be found on the Architectural Services' stand. A recent example of the application of this construction to an aerodrome building is the hangar at the Doncaster Municipal Aerodrome.

"FLIGHT" — Flight Publishing Co. Ltd., Dorset House, Stamford Street, London, S.E.1. (Stand 21.)—Apart from copies of *Flight*—to which no one reading this page needs an introduction—Stand 21 will display copies of *Squadrons of the Royal Air Force*, the book which has enjoyed such a success, together with examples of the fine pictures secured by *Flight* photographers.

Kaloroil Burners, Ltd., Victoria Road, London, N.W.10. (Stand No. 23.)—This company claims that the use of waste oil for firing boilers, although a new departure in oil burning, is, from both the technical and practical points of view, simple and satisfactory. It is showing the Kaloroil automatic burner for heavy oil, which operates on oil up to 200 in. viscosity, and the Kaloroil portable burner which can be used for night flares at aerodromes.

The King's Cross Truck Co., Ltd., King's Cross, London, W.C.1. (Stand No. 70.)—Two- and four-wheeled luggage trucks, transportable steps for passengers embarking and disembarking from aeroplanes, and a transportable engineers' bench for use when repairing machines and equipment on aerodromes are being shown on this company's stand. There is also a range of wheels and castors, a small truck for transporting accumulators in connection with emergency lighting, etc., and a section of extension ladder.

Parker, Winder and Achurch, Ltd., Regent Street, London, W.1. (Stand No. 56.)—This company's business was founded a hundred years ago. On Stand 56 there are pumps of various types and the electric submersible deep well pump can be seen at work. Then there is the Parwinac oil burner plant supplied in three models, with automatic, semi-automatic and manual control. Fencing is another product of the company.

Sir Isaac Pitman and Sons, Ltd., Parker Street, Kingsway, London, W.C.2. (Stand No. 21a.)—There is a selection of recent books on aviation on this stand. Outstanding among these is the *Encyclopædia of Aviation* compiled by Sqn. Ldr. C. G. Burge and priced at 15s. Sqn. Ldr. Burge is also the founder and editor of *The Air Annual of the British Empire*, the new seventh edition of which is also to be seen, price 21s. Technicians will be interested in *The International Index to Aeronautical Technical Reports* (5s.).

Siebe Gorman and Co., Ltd., 187, Westminster Bridge Road, London, S.E.1. (Stand No. 47)—The asbestos clothing for use in fighting aircraft fires and calibrators for altimeters and air-speed indicators shown by this company should interest aerodrome operators. Siebe Gorman and Co., Ltd., are also showing oxygen breathing apparatus, electrically heated flying clothing, safety belts and harness, etc.

Water Purifiers, Henfield, Sussex. (Stand No. 16.)—Examples of their domestic water softeners, the P type pressure filter and photographs of certain of its larger industrial water softeners and filter plants go to make up the exhibit of Water Purifiers. This company manufactures the Meludor and Zeroex water softeners.

The Yorkshire Copper Works, Ltd., Leeds. (Stand No. 15.)—On the stand of this company are samples of non-ferrous tubes, solid drawn (seamless) copper, aluminium and Yorcwyte and Yorkshire fittings, patent No. 419521.

Dennis Bros., Ltd., Guildford, Surrey.—Features of the Dennis motor lawn mower are a 4½ h.p. four-stroke engine, impulse starter, differential gear enabling the machine to turn in its own length, pressure-gun lubrication to seventeen important points and separate clutches for the rollers and cutters.

Martin-Baker Aircraft Co., Higher Denham, Bucks.—The Martin patent wind indicator is a product of this company. It measures 50 ft. in length, is easily visible by day or night from 6,000 ft. and is illuminated for night flying by twenty 40-watt lamps placed approximately 4 ft. apart. The standard steel pylon support is about 12 ft. high.

Metropolitan Vickers Electrical Co., Ltd., Trafford Park, Manchester, 17.—A recent product of this company is an apparatus for measuring wind velocity and direction at aerodromes.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS AIR MINISTRY ANNOUNCEMENTS

The King's Message to the Royal Air Force

The following gracious message has been received by the Secretary of State for Air from His Majesty the King and has been notified to all Air Force Commands:—

Buckingham Palace.

"On my accession to the Throne I desire at once to address a message to the Air Forces at home and overseas. The flying services were first created during the reign of my beloved father, and it was with close personal interest that he watched their rapid growth from small beginnings; their unification under the stress of war; and their subsequent development into a powerful instrument of defence, which shares with the older services the honourable duty of safeguarding these shores and the Empire.

I have ever valued my close association with the Royal Air Force, marked of recent years by a special connection with the Auxiliary Air Force as its Honorary Air Commodore-in-Chief. I have also witnessed with deep satisfaction the creation of the Air Forces of the Dominions and of India. If the Air Forces of the Empire are young they have all the vigour of youth; and, in the space of a few years, they have already achieved a high tradition. I shall watch their further progress with a keen personal solicitude for their welfare and with entire confidence that they will ever show that pride of service and unswerving loyalty to the Crown which they have displayed since their inception."

January 21st, 1936. (Signed) EDWARD R.I.

AIR COUNCIL'S MESSAGE TO THE KING

Viscount Swinton, Secretary of State for Air, has sent the following message of sympathy to His Majesty the King:—

"The Secretary of State for Air presents his humble duty, and, on behalf of the Air Council and the Royal Air Force, begs to tender their deepest and most respectful sympathy on the lamented death of His Gracious Majesty King George V."

The following gracious reply was received from His Majesty King Edward.—

"I sincerely thank the Air Council and the Royal Air Force for their kind expression of sympathy in my great sorrow.—Edward R.I."

ORDERS FOR MOURNING

The Air Ministry announces that the following orders have been issued to all Royal Air Force Commands:—

The Air Council have received the Commands of His Majesty the King to direct, on the present melancholy occasion of the death of His Most Gracious Majesty King George V, that officers and warrant officers of the Royal Air Force be required to wear a band of black crepe round the left arm, when in uniform, as prescribed by the Regulations, and also when wearing the greatcoat.

The mourning will be for six months from January 21, 1936, ending July 20, 1936.

No. 13 (A.C.) SQUADRON

The reunion dinner of No. 13 Squadron, R.F.C., and R.A.F., has been postponed from January 31 to February 7.

THE CARE, MAINTENANCE AND PACKING OF PARACHUTES

Courses of instruction for officers in the care, maintenance and packing of parachutes will be held, during 1936, at No. 3 School of Technical Training (Men), Manston. Courses, of six days duration, will commence on Monday of each week, with the exception of the weeks beginning April 6 and 13, June 1, August 3 and 10. The intake is limited to six officers.

THE NEW ZEALAND AIR FORCE

The newly elected Labour Government of New Zealand intend to increase expenditure on the Dominion's Navy and Air Force. In the year 1934-5 expenditure on the Air Force was only £132,230.

R.A.F. PORT DETACHMENT, LONDON

The R.A.F. Port Detachment, West India Dock, London, is renamed the R.A.F. Embarkation Office. The officer in charge is now known as the R.A.F. Embarkation Officer. The address, administration and duties remain unchanged.

FLYING AT CAMBRIDGE

It has been decided that undergraduates at Cambridge University may fly in the mornings, provided they have the permission of their tutors. Hitherto flying has only been allowed between 12.30 p.m. and 8.30 p.m.

CAMBRIDGE U.A.S.

The annual dinner of the Cambridge University Air Squadron will be held on Friday, March 6, at the C.U. Arms Hotel at 7.45 p.m. for 8 o'clock. Any old member wishing to attend should write to the Secretary, C.U. Air Squadron, Fen Causeway, Cambridge, as soon as possible.

SQUADRON NAVIGATION OFFICERS

It has been decided, as a temporary measure, to permit officers and airman pilots who hold the Civil Air Navigator's Licence, 2nd class, and are recommended by their C.O.s, to be considered for posting for squadron navigation duties.

OFFICERS' FAMILIES

It has been decided that sons, step-sons or statutorily adopted sons *up to the age of 18* shall be recognised as members of an officer's family for all purposes connected with the issue of married rates of allowances, including colonial allowance, and with entitlement to travelling by land and sea. This order takes effect from November 8, 1935.

R.A.F. SQUASH RACKETS ASSOCIATION

Flt. Lt. G. R. A. Elsmie has succeeded Flt. Lt. H. M. Mellor as honorary secretary, R.A.F. Squash Rackets Association. His address is: Flt. Lt. G. R. A. Elsmie, Central Flying School, Royal Air Force, Upavon, Marlborough, Wilts.

PRIZE ESSAY COMPETITION

The council of the United Service Institution of India has chosen the following subject for the Gold Medal Prize Essay Competition for 1936:—

"Certain conflicting requirements may be observed between the organisation of the Army at home and in India, owing to differences in the tasks of these forces. Keeping in mind the importance of the principle of standardisation of training and organisation in the Imperial forces, discuss the problems involved."

The competition is open to all gazetted officers of the Civil Administration, the Royal Navy, Army, Royal Air Force, Auxiliary Forces and Indian States Forces. Essays will not be accepted unless received by the Secretary on or before June 30, 1936.

THE EDINBURGH SQUADRON'S MAGAZINE

For the third successive year the report of the activities of No. 603 (City of Edinburgh) (Bomber) Squadron has been embodied in an attractive magazine, illustrated with some beautiful plates, and containing a number of interesting articles by well-known R.A.F. writers.

From the report we learn that flying instruction has been practically transferred to the Auxiliary instructors, and that much of the instruction of airmen is now done by Auxiliary N.C.O.s. During the year 1935 numerous huts for the accommodation of a regular squadron have been built at Turnhouse, and a new mess for officers has come into use.

ROYAL AIR FORCE GAZETTE

London Gazette, January 22, 1936

General Duties Branch

Pilot Officer on probation K. N. M. Eyres is confirmed in rank (December 1, 1935).

The following Pilot Officers are promoted to the rank of Flying Officer with effect from the dates stated:—J. G. Munro (March 29, 1935); W. F. Beckwith, G. H. Foss (seniority November 28, 1934); P. B. B. Ogilvie (seniority May 28, 1935) (June 30, 1935); J. A. H. Tuck (November 16, 1935); F. D. Nugent (January 7).

Wing. Cdr. W. H. Dolphin is placed on the retired list (January 20); Sqn. Ldr. A. G. Bond, A.F.C., is placed on the retired list at his own request (January 21); P/O. K. C. Willett is placed on the retired list on account of ill-health (January 13); the short service commission of Acting Pilot Officer on probation E. N. Wakelin is terminated on cessation of duty (January 12).

Stores Branch

W/O. F. C. Crowdy is granted a permanent commission as Flying Officer on probation with effect from and with seniority of January 6.

The following are granted permanent commissions as Pilot Officers on probation with effect from and with seniority of January 6:—B. O. Cannon, R. F. Folley, J. E. Garwood, D. H. M. Graham, L. A. Jackson, N. V. Lindemere, F. G. Metcalf, P. H. Stibbs.

The following Pilot Officers on probation are confirmed in rank and promoted to the rank of Flying Officer (January 4):—H. Stones, S. G. Walker.

Medical Branch

The following Flying Officers are promoted to the rank of Flight Lieutenant with effect from January 7 and with seniority of the dates stated:—A. W. Smith, M.B., B.S., J. W. Patrick, M.B., B.Ch., D.P.H. (January 7, 1935); J. S. Wilson, M.B., Ch.B. (January 16, 1935); C. A. Lewis, M.R.C.S., L.R.C.P. (March 7, 1935); R G. James, M.R.C.S., L.R.C.P. (July 7, 1935); G. H. Stuart, M.B., B.S., M.R.C.S., L.R.C.P. (October 29, 1935).

Dental Branch

Flt. Lt. J. G. Stewart, L.D.S., is transferred to the Reserve, Class D (January 19).

Chaplains Branch

A. J. Potts is granted a short service commission with the relative rank of Squadron Leader with effect from and with seniority of January 9.

PRINCESS MARY'S ROYAL AIR FORCE NURSING SERVICE

The following Sisters are appointed to the permanent service (January 1):—Miss J. R. Chadwick, Miss B. N. Cloke, Miss M. F. L. Elkington.

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

A. M. Webster (Flying Officer, R.A.F., Retired) is granted a commission as Flight Lieutenant in Class C whilst serving as a civilian technical officer at a Royal Air Force unit (December 19, 1935); Flt. Lt. A. G. Loton is transferred from Class A to Class C (January 22); F/O. G. P. Longfield is transferred from Class C to Class A (December 29, 1935); F/O. N. V. Lindemere relinquishes his commission on appointment to a permanent commission in the Royal Air Force (January 6); F/O. L. W. Van Oppen relinquishes his commission on completion of service and is permitted to retain his rank (October 19, 1935).

Stores Branch

F/O. J. E. Welman resigns his commission (December 31, 1935).

Medical Branch

F/O. T. P. Mulcahy, M.R.C.S., L.R.C.P., relinquishes his commission on appointment to a commission in the Indian Medical Service (December 27, 1935).

SPECIAL RESERVE

General Duties Branch

Flt. Lt. F. W. Hartridge, A.F.C., relinquishes his commission on completion of service and is permitted to retain his rank (November 1, 1935); F/O. F. L. Davis Salter is removed from the Service (January 1).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Air Commodore.—C. F. A. Portal, D.S.O., M.C., to Special Duty List; on appointment as Instructor at Imperial Defence College vice Air Comdre. W. S. Douglas, M.C., D.F.C., 14.1.36.

Group Captain.—A. Gray, M.C., to D. of T., Dept. of A.M.P., Air Ministry, vice Wing Com. P. Huskinson, M.C., 13.1.36.

Wing Commanders.—E. B. C. Betts, D.S.C., D.F.C., to D. of O., Dept. of A.M.S.C., Air Ministry, vice Group Capt. R. Graham, D.S.O., D.S.C., D.F.C., 14.1.36. P. Huskinson, M.C., to R.A.F. Station North Coates Fitties; to command, 13.1.36. A. D. Pryor, to No. 101 (B) Squadron, Bicester; to command vice Wing Cdr. E. B. C. Betts, D.S.C., D.F.C., 13.1.36. H. I. Hanmer, D.F.C., to Administrative Wing, Halton; for Administrative duties and to command vice Wing Cdr. S. P. Simpson, M.C., 20.1.36.

Squadron Leaders.—A. F. Lang, M.B.E., to Headquarters, Fighting Area, Uxbridge; for Signals Duties vice Sqn. Ldr. V. Greenwood, 4.12.35. J. D. S. Denholm, to Air Observers School, North Coates Fitties; for Armament duties, 23.12.35. W. V. Hyde, to Air Armament School, Eastchurch; for Specialist Armament course, 6.1.36. P. D. Robertson, A.M., to School of Air Navigation, Manston; for Navigation duties, 6.1.36. C. E. H. Allen, D.F.C., to No. 11 Flying Training School, Wittering, for flying duties in Advanced Training Squadron, 17.1.36. G. S. Shaw, to No. 5 Flying Training School, Sealand; for flying duties in Advanced Training Squadron, 16.1.36. C. F. Toogood, to Station Flight, Northolt; for flying duties, 15.1.36. C. R. Steel, D.F.C., to No. 18 (B) Squadron, Upper Heyford; to command vice Sqn. Ldr. G. S. Shaw, 16.1.36.

Flight Lieutenants.—The Earl of Bandon, to No. 10 Flying Training School, Ternhill, 13.1.36. D. J. Fayrs, to No. 1 Flying Training School, Ternhill, 15.1.36. V. S. Bowling, to No. 5 Flying Training School, Sealand, 13.1.36. T. S. Horry, D.F.C., A.F.C., to No. 5 Flying Training School, Sealand, 13.1.36. J. E. G. Thomas, D.F.C., to No. 48 (G.R.) Squadron, Manston, 13.1.36. L. R. S. Freestone, to Air Observers School, North Coates Fitties, 23.12.35. N. W. A. Cullum, to No. 820 (F.S.R.) Squadron, 1.1.36.

Flying Officers.—H. G. Lee, to No. 24 (C) Squadron, Hendon, 13.1.36. F. C. de la P. Beresford-Peirse, A. N. Combe, H. Y. Humphreys, I. G. MacKay, E. D. MacK. Nelson, P. de G. H. Seymour, D. R. Shore, and D. S. Kite, to Air Armament School, Eastchurch, 6.1.36. P. S. Salter, E. Foster, R. Hanson, A. C. Martin, and A. Threapleton, to Air Observers School, North Coates Fitties, 23.12.35.

Pilot Officers.—The undermentioned are posted to the Units shown on appointment to permanent commissions from the Royal Air Force College, Cranwell, with effect from 14.12.35:— A. R. Atkins, E. Banthorpe, J. A. Chorlton, P. J. K. Pike, to School of Air Navigation, Manston. R. K. Jeffries, to No. 2 (Army Co-operation) Squadron, Hawkinge. L. Mathias, to No. 4 (Army Co-operation) Squadron, South Farnborough. J. G. Thompson, to No. 7 (B) Squadron, Worthy Down. T. S. Rivett-Carnac, to No. 9 (B) Squadron, Andover. D. O. F. Lumsden, to No. 10 (B) Squadron, Boscombe Down. M. P. Skinner, to No. 13 (Army Co-operation) Squadron, Old Sarum. B. E. Smith-Rewse, to No. 13 (Army Co-operation) Squadron, Old Sarum. J. Darwen, to No. 25 (F) Squadron, Hawkinge. G. Elsmie, to No. 25 (F) Squadron, Hawkinge. J. D. Green, to No. 26 (Army Co-operation) Squadron, Catterick. C. H. Press, to No. 26 (Army Co-operation) Squadron, Catterick. W. L. Rowbottom, to No. 32 (F) Squadron, Biggin Hill. R. M. Longmore, to No. 66 (F) Squadron, North Weald. P. G. S. Dickenson, to No. 58 (B) Squadron, Worthy Down. J. N. Dowland, to No. 101 (B) Squadron, Bicester. A. G. Dudgeon, to No. 111 (F) Squadron, Northolt. F. R. Foster, to No. 215 (B) Squadron, Worthy Down. D. McIntyre, J. C. Mayhew, R. W. Reynolds, to R.A.F. Station, Gosport. D. H. S. Rusher, to No. 811 (F.T.B.) Squadron, 8.1.36. J. D. C. Joslin, to Air Observers School, North Coates Fitties, 23.12.35.

Acting Pilot Officers.—J. E. Jacobs and R. C. Waddell, to No. 30 (B) Squadron, Mosul, Iraq, 13.12.35. F. C. Hopcroft and J. C. McG. Lunn, to No. 55 (B) Squadron, Hinaidi, Iraq, 13.12.35. E. C. Eaton, to No. 84 (B) Squadron, Shaibah, Iraq, 13.12.35.

Stores Branch

Squadron Leader.—H. J. Payne, to R.A.F. Depot, Uxbridge, for Stores duties vice Sqn. Ldr. M. J. James, M.B.E., 13.1.36.

Flight Lieutenant.—C. L. Thompson, to No. 10 Flying Training School, Ternhill, 1.1.36.

Flying Officer.—F. C. Crowdy, to School of Store Accounting and Storekeeping, Cranwell; on appointment to a permanent commission as Flying Officer, on probation, 6.1.36.

Pilot Officers.—The undermentioned are posted to School of Store Accounting and Storekeeping, Cranwell, on appointment to permanent commissions as Pilot Officers, on probation, 6.1.36:—B. O. Cannon, R. F. Folley, J. E. Garwood, D. H. M. Graham, L. A. Jackson, N. V. Lindemere, F. G. Metcalf, and P. H. Stibbs.

Medical Branch

Flying Officer.—R. S. Peill, to R.A.F. Station, North Coates Fitties, 7.1.36. C. M. Carlyle-Gall, to R.A.F. Station, Aldergrove, 14.1.36. E. B. Harvey and D. S. MacL. MacArthur, to Medical Training Depot, Halton; on appointment to short service commissions with effect from 1.1.36.

Dental Branch

Flying Officer.—D. P. Boyle, to No. 5 Flying Training School, Sealand, 17.1.36. K. G. Swiss, to No. 3 Flying Training School, Grantham, 19.1.36. H. M. G. Williams, to Headquarters, Coastal Area, Lee-on-the-Solent, 22.1.36.

Chaplains Branch

Revd. A. J. Potts, to Headquarters, R.A.F., Cranwell; for duty as Chaplain (United Board), on appointment to a short service commission, 9.1.36.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for publication in these columns.

"Commercial Efficiency"

I SEE that Mr. D. W. Brown has compiled a list of the smaller civil aircraft, using my formula for "Commercial Efficiency." This may give the impression that the smaller types are more efficient than the large aeroplanes, but this is not necessarily so. I was, as stated in my article, comparing regular air line machines having luggage and lavatory accommodation—which, of course, take up space that might otherwise be used for passengers. The smaller civil types do not provide both of these amenities and should therefore be able to carry more passengers in proportion to their h.p.

By using my formula, small aeroplanes can be compared with each other and the air liners with each other; but when trying to compare the two different types, allowance must be made for the difference in accommodation.

With regard to your criticism, you will see, if you read my article, that the 190 h.p. I quoted is the rated output of the Gipsy VI and not the maximum power.

Walton-on-Thames. E. N. B. BENTLEY.

Genesis of Geodesy

IN your interesting article last week on geodetic construction, you state that many examples of it may be found outside the aircraft world.

Reference to pre-war issues of *Flight* might show that the old German Schütte-Lanz airships were flying examples of "geodesy," for the description of a model of the S.L.1 in the Science Museum includes the passage: "The structure consisted of a number of circular hoops placed transversely across the hull and held in correct relation to one another by multiply wooden girders arranged spirally." Certainly the appearance of the model suggests a geodetic form of construction.

It would be interesting to know whether, in addition to their other original improvements in airship design, the Schütte-Lanz concern used this type of structure. If so, it is amazing that, in common with such people as the firm of Junkers, they did not follow up the idea as Mr. Wallis has done.

London, N.W.6. A. V. CLEAVER.

[Our correspondent is correct in his assumption that a form of geodetic construction was employed in the Schütte-Lanz airships; but to adapt it to the much higher and more localised loadings of heavier-than-air craft is a long step.—ED.]

That Gliding Subsidy

OWING to misleading statements in the Press regarding the Government subsidy for gliding and its distribution, it is due to the tax-payers of the country that a few of the facts should be stated.

The efforts made by those who were responsible for the post-war revival in gliding in this country resulted in the Government's decision to make the grant in aid of those clubs which had shown themselves effective but, nevertheless, were unable to carry on without aid.

As soon as this decision was made the one club in the country which justifies the doubtful statement that "Gliding is a sport for gentlemen" (i.e., for those of means), sought re-entry into the British Gliding Association (through which the Air Ministry was proposing to administer the grant), and so acted that the Air Ministry decided that the grant would only be paid through a united Association. Thus that club gained re-admission to the Association, and it was agreed by both sides that those who had been in conflict should stand down from future negotiations. However, those in the re-admitted club did not keep to this agreement, as did those of the other side, and by this and other means this one club gained control of the re-organised British Gliding Association and of the Committee set up within the Association to administer the grant.

This unilateral Committee then drew up terms with which clubs had to comply before applying for grant, these terms being particularly favourable for the one club referred to, and certain conditions of application were included, under those qualifying terms, which were definitely exclusive.

The result is that only two or three clubs have received State assistance. The one club which was not in need of aid has taken more than half of the total amount available for clubs—£2,500 of the tax-payers' money to those gentlemen who, owning their own high-performance machines, have put up performances which skilled provincial pilots are unable to approach because they are not allowed help for the purchase of such machines and cannot afford to buy them privately. And it is on the strength of these performances that that club claims its efficiency. There are provincial clubs which can, in proportion, show a better record but which are now quite unable to get a penny of assistance.

Conditions for claiming subsidy have been stated in the Press to be "simple." This really refers to the qualifications with which clubs must comply before submitting a claim, which are by no means simple—as the majority of the leading gliding clubs will maintain. But the "conditions" under which a claim may be put forward by a "qualified" club are restricted and absurd.

The purpose for which the grant was made is, at the moment, utterly defeated. (Miss) R. H. SINCLAIR,

Sutton Courtenay, Berks. Hon. General Secretary, Federation of British Gliding Clubs.

The Burnelli Aerofoil Body

IN *The Aircraft Engineer* supplement of *Flight* of December 26, 1935, there appeared an article entitled "The Burnelli Aerofoil Body." An explanation on our part regarding the origin, purpose and content of this article may be helpful.

The subject matter was written by Dr. Michael Watter as a preliminary report in the course of his research of some underlying principles of our type of aeroplane. The artifice of the use of a hypothetical aspect ratio of the body was resorted to for the sake of expediency in an attempt to interpret the significance of the proper co-ordination of zero lift angles and to assist in a basic understanding of this problem.

Since that time, Dr. Watter has made further studies of this problem based on the exact approach treating the body-wing combination as a distorted aerofoil, in which case no such artificial assumption as appeared in the article is required. In connection with these investigations considerable wind tunnel research was conducted, which confirmed all our predictions regarding uniform lift distribution and the extent of aerofoil body lift which amounts to 27 per cent. of the gross in the UB-14 type. This explanation is made because of the obvious criticism which may arise in connection with the simplifying assumption used in the article.

Keyport, New Jersey. BURNELLI AIRCRAFT, LTD., VINCENT J. BURNELLI.

Encouraging the Private Owner

"INDICATOR," in your issue of January 23, is, indeed, as depressing as the weather. But, really, are things quite as bad as that? It is true that, at the moment, the number of days on which flying is possible for the average amateur makes ownership a very expensive pleasure or convenience.

In these circumstances, the sensible thing to do is to pay for an aeroplane only when you use it; in other words, to hire until the time comes when the better aeroplane is made. There is nothing against this; a modern hire fleet gives the hirer at least as good a machine as he could buy and, in nine cases out of ten, one far better kept. He gets a machine kept for the purpose, not a second-hand machine awaiting sale, or a "school" machine not on its usual duty.

Thus, there is no reason why the number of *potential* owners shall not be increased now, without waiting for the perfect machine. After all, the greater the increase in the number of potential owners (all pilots), the sooner will manufacturers be able to spend the large sums on experiment and development which alone can give us what is wanted.

Heston. C. W. WRIGHTSON.

In Brief

The words "sinking in a partly slatted condition," which occurred in Flt. Lt. G. M. Buxton's letter on tapered wings in *Flight* of January 16, have an unfortunately Bacchanalian air; what our correspondent actually wrote was "yet there is positive aileron action when sinking in a partly *stalled* condition."

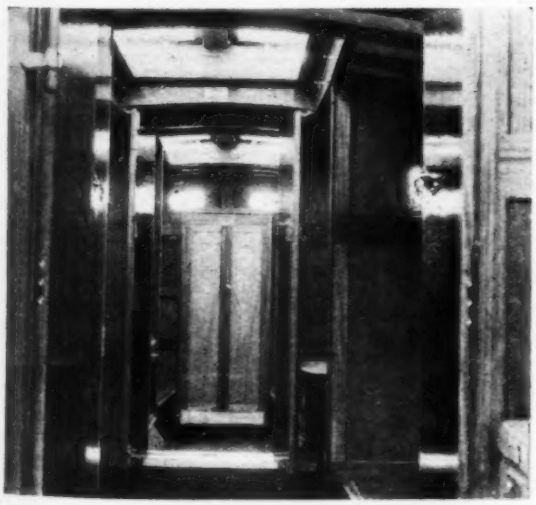
FOR PATROLLING the TIMOR SEA

A High-speed Launch to Look After the Flying Boats : Range More Than 900 Miles : D/F. Wireless

FINAL trials have just been completed in Southampton Water of a new launch designed and produced by Mr. Hubert Scott-Paine's British Power Boat Company for patrol and rescue work in the Timor Sea in connection with the new Empire air services. The launch, which is of typical Scott-Paine construction, is driven by three 100 h.p. Power-Meadows engines. With a length of 45ft. and a beam of 10ft. the craft has a maximum draught of 2ft. 9in. when fully loaded. The hull is planked with mahogany and sheathed with Tungum bronze alloy.

Equipped with Marconi directional wireless of 500 miles' range, the craft will be able to maintain touch with shore stations and also with flying boats on their way across the Timor Sea. Should any flying boat be in trouble, her messages will be picked up by the launch, which will set out at once to her rescue. Sleeping accommodation is provided for a crew of five, but the launch will be able to rescue and convey to the nearest land some forty or fifty persons if need be—although it may be some time before flying boats carry so many passengers.

Two views of the Scott-Paine Patrol and Rescue Launch at speed, and a peep over the helmsman's shoulder. (*Flight* photographs.)



A view through the cabins, looking forward. Note the wide doors, which will admit stretchers without tilting. (*Flight* photograph.)

An exceptionally large fuel capacity (800 gallons in five tanks) is provided, giving the launch a range at high speed of 950 miles. As the Timor Sea crossing is approximately 500 miles, there is an ample reserve.

Rescue Work

To assist in picking up a flying boat on the sea at night, a very powerful searchlight (750 watts) is carried; this has a range of more than half a mile. The launch has been specially designed for rescue work, with all doors wide enough to admit stretchers without tilting, and two ladders and platforms, rather like bo's'ns' chairs, are arranged to enable stretchers to be placed under persons before lifting them out of the water.

When the Empire air route to Australia with the new Short flying boats comes into operation, it will be reassuring for passengers to know that the four engines make a forced alighting unlikely, but that, if one is inevitable, there is a Power Boat launch in wireless touch, ready to come to their aid.

THE INDUSTRY

Pou Power

IT is reported that the Coventry Victor Company, of Coventry, has started production of engines for *Poux-du-Ceil*. The units are horizontally opposed four-cylinders of 1½-litres capacity.

Twenty-seven Years After

IN their "Monthly News," James H. Randall and Son, Ltd., of Green Street Works, Paddington, London, W.2, reproduce a page from *Flight* of November 13, 1909, containing an advertisement for their aircraft fuel tanks. It is interesting to observe that they still specialise in sheet-metal work of this kind—or, to be strictly accurate, of a more modern kind.

Yeadon Development

ON page 105 appears a photograph of Yeadon, the Leeds-Bradford municipal airport, which is shortly to be greatly extended. The Joint Airport Committee have invoked the aid of Messrs. Stavers H. Tiltman, L.R.I.B.A., and Mr. M. H. Volk, F.R.Ae.S., who were responsible for the entire planning, layout and design of the Brighton-Hove-Worthing airport.

C.P. Airscrew Appointment

IT is announced that Dr. W. Ker Wilson, Ph.D., Wh.Ex., whose paper on "Torsional Vibration in Engine Crankshafts" appeared in the *Institution of Automobile Engineer's Journal* of October, 1935, has joined the de Havilland Aircraft Company. His work will be on the design side of the de Havilland controllable-pitch airscrew. Dr. Wilson's connection with engineering extends over many years, and his experience should be of considerable value.

The Constant Check

FOLLOWING their policy of strict laboratory control of their output, High Duty Alloys, Ltd., have just completed a new laboratory building—the fourth since the company's inception in 1928—at their Slough works. The new block contains a chemical laboratory, production and research physical laboratories, photographic and metallographic rooms (including X-ray departments), experimental foundry, experimental heat treatment room, research library and offices. The associated companies, Magnesium Castings and Products, Ltd., and High Duty Bronze, Ltd., will share the benefit.

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

AIRCO LTD.—Private company, registered January 14. Capital £1,000 in £1 shares. Objects: To act as consultants, designers, etc., in connection with all kinds of aeronautical undertakings. First directors to be appointed by the subscribers. Secretary: Ernest H. Ford.

HARBOROUGH AIRCRAFT CONSTRUCTION COMPANY LTD.—Private company, registered January 21. Capital £20,000 in 5,500 8% cumulative preference and 12,500 8% cumulative preferred ordinary shares of £1 each and 40,000 ordinary shares of 1s. each. Objects to acquire the business carried on at Market Harborough as the National Aircraft Company; to adopt agreements (1) between J. G. Navarro and L. H. Mackay and E. W. Vernall, and (2) between J. G. Navarro, L. H. Mackay, E. W. Vernall and this company, and to carry on the business of designers, manufacturers and repairers of aeroplanes, parachutes, engines, etc. The subscribers are: Lewis H. Mackay, Vine Cottage, Farnham Common, Bucks, engineer; Sydney A. Schofield, 64, Atherfold Road, London, S.W.9, solicitor. The first directors are Lewis H. Mackay, and William L. Pengelly, of 14, South Square, Gray's Inn, London, W.C.1. Registered Office, 14, South Square, Gray's Inn, London, W.C.1.

WEYBRIDGE AIR SERVICES, LTD.—Private company, registered January 22. Capital, £100 in £1 shares. Objects: To adopt an agreement with Capt. Godfrey Bremridge, A.F.C., and to carry on the business of carriers of passengers goods an mails in aeroplanes, etc. Subscribers: Godfrey Bremridge, Ikona Park, St. Georges Avenue, Weybridge, Surrey, air pilot. Bernard L. Bremridge, 8, St. Thomas Street, Winchester, solicitor. Godfrey Bremridge is permanent director and chairman.

SOFAL LTD. Private company, registered January 20. Capital, £100 in £1 shares. Objects: To acquire and exploit businesses relating to the manufacture or treatment of materials used in connection with aircraft and automobile manufacture, etc. Subscribers are, Charles A. Soutar, 3, St. James's Square, London, S.W., company director, and William A. C. Brough, same address, accountant. First directors to be appointed by the subscribers.

INCREASES OF CAPITAL

CRILLY AIRWAYS, LTD. (14, Waterloo Place, London, S.W.1).—The nominal capital has been increased by the addition of £138,000 beyond the registered capital of £12,000. The additional capital is divided into 552,000 preferred ordinary shares of 5s. each. The company has also been converted into a public one.

BRITISH AIRWAYS, LTD. (18, Austin Friars, London, E.C.).—The nominal capital has been increased by the addition of £245,140, in £1 ordinary shares, beyond the registered capital of £100. This company was registered as a private one on September 30, 1935, under the style of Allied British Airways, Ltd., and renamed as above on October 29, 1935. It was converted into a public concern on December 11, 1935. The above increase is for the purpose of acquiring the undertaking and assets of Hillmans Airways, Ltd., United Airways and Spartan Air Lines, Ltd.

AIR TRAVEL LTD. (Penshurst Aerodrome, Leigh, Kent).—The nominal capital has been increased by the addition of £6,500, in £1 ordinary shares, beyond the registered capital of £500.

WESTERN AIR TRANSPORT LTD. (40, Broad Street, Bristol).—The nominal capital has been increased by the addition of £26,000 in £1 shares beyond the registered capital of £4,000. This is a "private" company, registered on December 12, 1935, to purchase such of the present or future debts due and owing or to become due and owing by Norman Edgar (Western Airways) Ltd.

FEARSOME MONSTERS at work at Ringway, Manchester's new airport. Actually, they are surfacing machines operated by the En-Tout-Cas Company and they have carried on undeterred by the recent heavy snow. By the aid of a special lighting system they are working by night as well as by day.

PUBLICATIONS, ETC., RECEIVED

Annual Report of the Board of Regents of The Smithsonian Institution, 1934. Price $1.00. Superintendent of Documents, Washington, D.C., U.S.A.

Physiologie des Menschen im Flugzeug. By Dr. Gustav Schubert. Price RM 14,80. Von Julius Springer, Linkstrasse 23-24, Berlin, W.9, Germany.

Annuario Militar do Brasil 1934. Praça Floriano, Rio de Janeiro.

Report of the City of Edinburgh (Bomber) Squadron, 1935. Auxiliary Air Force, Turnhouse, Edinburgh.

Aeronautical Research Committee Reports and Memoranda: No. 1659: Split Flaps and Other Devices for Facilitating Landing, by S. B. Gates; price 1s. 3d. No. 1664: Note on Boundary Layer Flow, by H. B. Squire; price 9d. No. 1665: Rolling and Yawing Moments on Half Wings with Various Modifications of Wing Tips, by D. H. Williams; price 1s. No. 1667: A Distribution Method of Stress Analysis, by Prof. J. F. Baker and A. J. Ockleston; price 3s. 6d. H.M. Stationery Office, Kingsway, London, W.C.2.

Learning to Fly, by F. A. Swoffer. Price 7s. 6d. 4th Edition. Sir Isaac Pitman and Sons Ltd., Parker Street, Kingsway, London, W.C.2.

Tool Steel Catalogue. English Steel Corporation Ltd., Vickers Works, Sheffield.

Air Publication 1358: *Dress Regulations for Officers of the Royal Air Force*. Price 5s., postage extra, H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

Air Publication 1234: *Manual of Air Navigation, Vol. I*. Price 6s., H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

Aero Engines ("D" Licence), by A. N. Barrett. (Aeronautical Engineering Series, Ground Engineers). Price 3s. 6d., Sir Isaac Pitman and Sons, Parker Street, Kingsway, London, W.C.2.

Brass and other Copper Alloy—Wire and Wire Products. Copper Development Association, Thames House, Millbank, London, S.W.1.

Early British Balloon Posts, by John Pringle, M.D. Privately printed. Price 7s. 6d.

Mechanical World Year Book, 1936. Price 1s. 6d., Emmott and Co., Ltd., 31, Bedford Street, Strand, London, W.C.2.

Guide du Tourisme Automobile et Africain au Sahara, 1936. Asiatic Petroleum Co. Ltd., St. Helens Court, Gt. St. Helens, London, E.C.3.

AERONAUTICAL PATENT SPECIFICATIONS

(The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

(Published January 23, 1936).

18124. BUGATTI, J.: Apparatus for testing the resistance of structural parts, particularly parts of aeroplanes (440,198).

19008. HAWKER AIRCRAFT, LTD., DAVIES, S.D. and DOWN, C.R.: Retractable undercarriages for aircraft (440,358).

11238. MODESSE, A.: Means for supercharging internal-combustion engines on aircraft (440,303).

15768. KARKI, Y., VAHERMO, M., and ARO, E.V.: Device for automatically steering aircraft, ships, and the like (440,243).

(Published January 30, 1936).

19564. ARMSTRONG WHITWORTH AIRCRAFT, LTD., Sir W. G., SIDDELEY, Sir J. D., AND WYLIE, H. N.: Airscrews (440,655).

19575. VICKERS (AVIATION), LTD., GLEN, W. A., and RAYNER, F. W.: Apparatus Apparatus for handling engines (440,656).

19625. MAZZINI, F.: Air-Circulating valve in the supporting surfaces of aeroplanes (440,659).

23338. NAAMLOOZE VENNOOTSCHAP NEDERLANDSCHE INSTRUMENTEN CIE NEDINSCO: Apparatus for finding the magnitudes of lead for anti-aircraft fire direction devices (440,715).

25812. PILAIN, R.: Sighting-correction apparatus for guns mounted on aircraft (440,475).

28751. WILKENING, F. W.: Aircraft (440,476).